THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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CLEVELAND, O., MARCH 19, 1891.

THE WEEK IN IRON CIRCLES.

General Features. The most important event of the week is the accumulation of evidence of the most positive character that the long-drawn-out strike in the Connellsville region will result in the defeat of the coke drawers. Without betraying any confidence it may be said with the assurance of almost absolute certainty that the men have lost the fight, and that the coke syndicate is strong enough to carry its point, whether the result is known in a month or three. The situation is one that favors the operators, and it is therefore presumed that they will make the most of it. With this reduction the furnaces will be enabled to get coke at a living rate. There are no new features to the Cincinnati market. Demand has continued fair. There have been no heavy transactions closed, but a fair run of medium-sized orders about equally distributed over the whole range of territory from St. Louis to Buffalo. Foundries are not melting as much iron as they were in December and January, but the restriction in the output of pig iron has been more marked. The rate of production is now lower than at any period for about two years past. Railroads are restricting purchases to the smallest possible limits. It is stated by leading railroad authorities that more liberal orders for equipment will be given out within 60 or 90 days. Prospects for consumption of iron for building purposes are excellent throughout the West if labor troubles do not put a step to enterprises on foot. The coke strike shows some signs of collapse. In the Birmingham district 19 out of 20 furnaces are in blast. Taking the State of Alabama together only about one-half of the furnaces are active. Over one-half of the charcoal furnaces South are idle. There seems to be considerable difficulty in getting iron for prompt delivery from the Detroit district. Many founders who have been depending upon Northern grades are now in the market for Southern, and it would seem inevitable that prices for this grade of metal must advance if the coke strike be further protracted and while we have noticed some arrangements made among the smaller operators, the larger ones are as far from settlement with the coke workers as at the first, and no intimation as to the time that the difficulty will be adjusted has been made by either party at the present time. Accordingly, coke made irons of all description are firm, no sales being made of Northern irons except subject to the special conditions respecting the coke strike. Lake Superior charcoal iron has been in good demand at regular market figures, and some considerable transactions have been consummated during the past week, chiefly from the East, as referred to in our last report, although some orders have been taken among our local manufacturers for cars which has caused them to purchase considerable pig iron. For the most part, business during the past week at Chicago has consisted of car load orders, consumers generally being unwilling to pay the advanced figures at which the coke furnaces, both Northern and Southern, are holding. Prices on the other hand are being well maintained, furnace companies being very independent, declining for the most part to make contracts for long-scattered deliveries. Lake Superior charcoals continue very quiet, prices on iron of this class remaining unchanged. The main key in the present situation is considered to be the culmination of labor difficulties in the Connellsville coke district. If existing strike continues indefinitely, present prices on pig metal will certainly be maintained and in many cases advanced. Many consumers, however, look for an early adjustment and argue that existing prices on iron in pig form will then have to be again reduced. The past week has established the higher prices at St. Louis that the Southern furnaces have been asking. Consumers seem to realize that the market is on the advance and are buying more freely than a few weeks ago. The furnaces, on the other hand, are not disposed to take orders for extended deliveries, and the supply of certain grades is quite limited, even for immediate shipment. The situation of the coke strike is unchanged. The operators are not willing to accede to the demands of the miners, and at present, we see no indications of an early settlement. The Louisville market remains unchanged, and is very unsettled, there having been some medium orders placed at full figures, but as a whole a quiet market prevails at current figures.

The Local Situation. Although the week has been a quiet one and without anything decisive either as to sales or a change in prices, it is the opinion of the oldest and best posted men in the business that there is an important change impending. Whatever the change may be, it can only be for the better, so that nobody need feel concerned about it. Just in what way affairs are to be affected, is not quite clear, either; but the reasoning is all in favor of a break in the coke situation. The ore interests must necessarily remain dormant until the furnaces start up again, and as that event is predicated upon the action of the coke people, the only other avenue open for speculation is the coke question. From recent advices of unquestioned authority it may be set down as a fact that the employers are firmly resolved to adhere to their demand for a ten per cent. reduction in wages, if the lock-out should last a year. They say that if they expect to carry on a paying business in the future, they must make coke for the furnace market for a dollar and a half a ton, even though they could find some custom now at the old price, $1.90. The reason is a good one, too, if it is considered that the increased profits of such action would be out of all proportion with the tremendous falling off in the consumption of coke, so that in the end, and in the aggregate, the fixed charges of the coking plants could not be met even with the higher rate, while a fair profit remains at the $1.50 rate, if the production is up to the full capacity of the coking plants The ore situation is the most uncomfortable imaginable. Whatever sales might be made—and there are some very strong furnace concerns who would not be averse to making a favorable contract—are subject to future prices, that is, the sales when made have a string to them which may be pulled by the purchaser at his convenience. Under the circumstances, the ore trade, generally, is keeping well out of the market, and some of its leading representatives do not think that any considerable sales will be recorded until well into June, or still later. The vessel men have taken exactly the position outlined in our last report, and will favor a late opening of navigation, with the view of making the season a short and lively one. The visible supply of pig iron in this vicinity is running decidedly low, and but for the activity of some Pittsburgh furnaces that are still supplied with coke, there would be a great boom for Southern iron, a demand for which seems to have sprung up among consumers who before the shut-down would never entertain the idea of using other than lake iron. Still, the furnacemen have no fear from that competition, if they were only assured of cheaper coke, as above stated. "Given dollar-and-a-half coke," said one furnace man, "and with the new rates of lake and rail freights, coupled with the reduced price of ore and labor, this district can beat the world in the making of the best iron ever produced." Manufactured iron, despite the lateness of the season, has not, as yet, recovered from its late slump, but it is thought that the approach of Spring, and the needs of the building trades, will soon bring about a change for the better in all these lines.

THE LAKE PORTS AND THE IRON ORE TRAFFIC.

It is unfortunate that the census authorities could not have brought down their figures for the traffic of the Great Lakes to a later date than the year 1889; but the results of their inquiries in this fruitful field (now for the first time before us in an official form) are of much interest, nevertheless. Especially instructive are they in reference to the different ports engaged in the transportation of iron ore. Confining our present inquiry to the ore-receiving ports, we find that their receipts for 1889 were as follows:

PORTS.	Receipts.		
	Amount in tons.	Per cent. of total iron ore traffic.	Per cent. of total port traffic.
Chicago	731,188	9.59	14.42
Buffalo	333,827	4.38	8.25
Cleveland	1,951,564	25.59	71.28
Ashtabula	2,199,109	28.84	99.71
Milwaukee	124,312	1.63	7.85
Toledo	97,476	1.28	19.25
Erie	418,426	5.49	54.12
Duluth	10 691	0.14	1.57
Tonawanda	17,166	0.22	1.64
Fairport	928 616	12 18	98.89
Detroit	117,247	1.54	19.04
Ogdensburgh	2 587	0.03	0.55
Lorain	335,162	4.39	96 62
Sandusky	508,411	2.73	68 33
Total	7,626 073	100.00	29.40

It will thus be see that, while Ashtabula is the largest ore-receiving port on the line of lakes, her general traffic amounts to practically nothing. In the case of Cleveland, while she ranks next to Ashtabula as an ore receiver (representing more than 25 per cent. of the entire iron ore traffic of the lakes) the iron ore business represents 71 per cent. of her entire traffic, the remaining 29 per cent. being miscellaneous cargoes of agricultural products, merchandise, etc. Chicago, on the other hand, looks rather to her general business, her share being only 9.59 per cent. of the entire ore receipts of the lakes and the proportion to her entire port traffic being only 14.42 per cent. It will also be observed that of the grand total of 7,676,073 tons received in 1889, Lake Erie ports received 6,692,635 tons, or 85.9 per cent. of the whole. Of the 983,438 tons sent to Lake Michigan ports and Detroit, Chicago takes 731,188 tons, or nearly 75 per cent.

HIGHLY IMPORTANT TO OHIO MANUFACTURERS.

As passed by the Ohio Senate, the so-called Rawlings bill is as follows:

Every person who shall purchase, receive, or hold personal property of any descripaion, for the purpose of adding to the value thereof, by any process of manufacturing, refining, rectifying, or by the combination of different materials, with a view of making a gain or profit by so doing, shall be held to be a manufacturer, and he shall, when he is required to make and deliver to the assessor a statement of the amount of his other personal property subject to taxation, also include in his statement and list for taxation all material or articles of any kind, finished or unfinished, at their true value in money, purchased, received, or otherwise in hand, or elsewhere stored or held for the purpose of being used in whole or in part in any process or operation of manufacturing, combining, rectifying, or refining, and also include a statement of, and the value of all manufactured articles on hand, in actual possession or elsewhere held for sale or storage, and in addition thereto attest on oath or affirmation the statement and value of all such personal property appertaining to his business as a manufacturer, including manufactured articles on hand, and that no such property has in any manner been disposed of or secreted for the purpose of evading taxation, provided manufacturers shall not be required to include in such statement any of their finished manufactured products, wholly manufactured subsequent to the first day of the next preceding January. Every such manufacturer shall also list at their fair cash value all engines and machinery of every description, used or designed to be used in any process of refining or manufacturing (except such fixtures as shall have been considered a part of any parcel or parcels or real property), including all tools and implements of every kind used or designed to be used for the aforesaid purpose owned or used by such manufacturer.

We print the bill in full, first, to point out wherein it is changed from the original measure, and second, to let manufacturers in other States see to what our legislation is coming when dictated by the farming interests. In the first place, it should be understood that the bill as passed is not satisfactory to the farmers (?), in that it does not go far enough The first proviso, that manufacturers shall not be required to include in their statement any of their finished manufactured products wholly manufactured subsequent to the first day of the next preceding January, was fought by the agricultural interests with all the force at their command, and the fight, it appears, is to be carried into the House. It would appear that a sufficient concession to their crude ideas was made in the bill as passed, but it seems that they insist upon the whole loaf. It is to be hoped that the manufacturers of Ohio will see to it that the bill (which, even in its present shape, is open to grave objection on the ground of double taxation) is not amended in the House to suit the whims of the hayseed statesmen who appear to be temporarily in position to dictate terms as foolish as they are unjust.

OHIO AND ALABAMA AS PIG IRON PRODUCERS.

Commenting on the statistical position of the iron industry in the United States, the *Colliery Guardian*, of London, says:

The metallurgical pre-eminence of Pennsylvania is greater now than it ever was. Ohio, also, is still turning out a greater quantity of pig every year, having made 1,389,170 tons in 1890, as compared with 553 963 tons in 1885, showing an increase of 835,207 tons in the five years. The utmost which can be said for the Southern States is that Alabama—which is their chief metallurgical stronghold—made 914,940 tons of pig iron in 1890, thus displacing Illinois from the position of the third iron-making State, which she occupied up to 1888. At the same time it is probably right to remark that the next five years may witness a material change in the relative positions of the Southern States and the Northern and Western States in the matter of metallurgical enterprise. The output of pig in Alabama has certainly been advancing with extreme rapidity, and the productive resources of that increasingly important State are becoming greater and greater every year. It is quite possible that Alabama may work into the second place among the iron making States of the Union by 1895, but it seems quite out of the question that she should ever pass Pennsylvania in the industrial race.

It would appear, then, that the race for pre-eminence in pig iron production now lies between Ohio and Alabama. That Alabama will materially increase her output during the next five years there can be no doubt. At the same time, it must not be forgotten that, whereas Alabama must look for some time yet to the Northern States for a market for its pig iron, the blast furnaces of Ohio have a market right at their doors for all they can produce. Ohio has what Alabama has not yet developed to a very large extent, *i. e.*, widely diversified industries, many of them with practically unlimited capital and enjoying years of prestige. With anything like the liberal policy adopted by the Southern railroads, Ohio furnaces could not only hold their own, but could make prodigious strides during the next five years. Only a narrow and selfish policy on the part of the Northern railroads can retard this legitimate growth. Even in the face of this unjust discrimination, the annual output of Ohio furnaces in 1890 was 835,207 tons in excess of that reported in 1885. We do not look for a very large increase in 1891, but Alabama is still very far from second place.

OUR friend, the Connellsville (Pa) *Courier*, which ably represents the coke interests of the Connellsville region, inadvertently refers to *The Iron Trade Review* as "the organ of the Valley furnace men." Our friend is laboring under a misapprehension. This journal is not the "organ" of any interest. It is simply a business enterprise, and not one dollar of its stock is owned by a Valley furnace man, or any other furnace man, or by any Lake Superior mine owner, or by anybody interested in any way with the iron manufacturing business. *The Iron Trade Review* has always endeavored to give the news as it found it, regardless of special interests, and it expects to go right on doing so. It is interested in what concerns the iron and steel business of the country, but it is the "organ" of no interest, clique, faction, or individual.

THE South, in common with other sections of the country, is suffering from temporary, though by no means serious, depression in business. The *Tradesman*, in search of information as to the outlook, received 183 reports from special correspondents throughout the Southern States. Of these, 65 make no definite statement as to the manufacturing and business outlook, 30 think that the future is not bright, and 88 are strongly of opinion that prospects are good. The manufacturing interests dealing with iron and with textiles are quite unanimous in their favorable opinions, and there is some difference of opinion among the lumber men, with a majority in favor of a hopeful outlook. In our opinion, the optimists will not be disappointed

CLEVELAND'S exposition project is making slow but steady progress. An incorporation has been effected, on the basis of $500,000 capital stock, and sub-committees have been appointed to solicit stock among the various lines of business. So deserving an enterprise should not be allowed to lag for want of support.

ANDREW CARNEGIE, in a recent interview, cast his horoscope of the future of the iron trade and discovered a rather gloomy outlook. His chief hope is in good crops next year, and a better state of finances in London, which at present is none of the best.

CANADIAN railroads have recently placed some very heavy orders for steel rails with Middlesborough and Sheffield firms—quite a wind fall for English manufacturers.

CONDITION OF THE BLAST FURNACES OF THE UNITED STATES.

March 1, 1891.

[CONDENSED FROM THE AMERICAN MANUFACTURER.]

LOCATION OF FURNACES.	CHARCOAL.					BITUMINOUS OR COKE.				
	Total No. of Stacks.	In Blast.		Out of Bl'st.		Total No. of Stacks.	In Blast.		Out of Bl'st.	
		No.	Week'y capac-ity.	No.	Week'y capac-ity.		No.	Week'y capac-ity.	No.	Week'y capac-ity.
New England	14	9	819	5	398					
New York	9	1	108	8	1,017	6	4	3,176	2	1,502
Pennsylvania	14	2	210	12	793	1	0	0	1	600
Upper Susquehanna Valley						24	16	19,025	8	8,974
Pittsburgh						1	1	507	0	0
Spiegel						1	0	0	1	930
Allegheny Valley						17	3	2,260	14	10,971
Shenango Valley						4	1	1,060	3	1,778
Youghiogheny Valley						19	9	4,333	10	5,009
Juniata and Conemaugh Valleys						3	1	1,411	2	1,457
Maryland	7	4	336	3	330	14	7	3,458	7	3,466
Virginia	11	2	111	9	578	1	1	100	0	0
North Carolina						6	0	0	6	3,606
West Virginia	2	0	0	2	130	15	3	2,218	12	7,798
Ohio—Mahoning Valley						17	7	5,156	10	4,658
Eastern, Central and Northern						14	4	989	10	3,037
Hocking Valley						14	9	2,216	5	940
Hanging Rock	12	5	401	7	740					
Miscellaneous						5	3	934	2	720
Kentucky	1	0	0	1	95					
Hanging Rock										
Western Region and Miscellan'ous						12	8	4,180	4	1,538
Tennessee	8	3	559	5	971	2	0	0	1	675
Georgia	3	1	133	2	246	38	18	11,424	20	12,695
Alabama	14	4	1,068	10	2,101	2	1	235	1	126
Indiana						13	6	9,953	7	7,041
Illinois						1	1	379	0	0
Spiegel										
Michigan	23	12	3 935	11	3,477					
Wisconsin	5	4	1,753	1	120	4	3	2,460	1	422
Minnesota						1	0	0	1	140
Missouri	2	1	312	1	315	5	0	0	5	3,764
Texas	3	1	179	2	506					
Oregon	1	1	280	0	0					
Colorado						2	1	538	1	350
Utah										
Washington	1	0	0	1	205					
Total charcoal and coke	130	50	10,204	80	12,025	242	107	73,027	135	88,191
Total anthracite	162	93	37,514	69	22,490					

SUMMARY.

FUEL.	IN BLAST.					OUT OF BLAST.			
	Number.			Weekly Capacity.			Number.		Weekly Capacity.	
		Month Previous.	Year Previous.	Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	50	58	57	10,204	12,141	12,223	80	71	12,025	9,515
Anthracite	93	97	116	37,514	39,759	48,280	69	65	22,490	20,740
Bituminous	107	119	169	73,027	87,439	119,321	135	122	88,191	74,360
Total	250	274	342	120,745	139 339	179 830	284	258	122,705	104,615

THE OUTLOOK FOR DOMESTIC STEEL.

In viewing the growth of the steel industry in the United States, the question naturally arises as to whether its rate can long be maintained. According to Commissioner Wright's recent report, the total cost of materials and labor in making a ton of steel rails at one establishment where inquiries were made was $24.79, and at another $27 68. This excluded expenses for interest, insurance, depreciation of plant and royalty to the owners of the soil. Yet the price of steel rails is now only $28 to $30 at the mill. If the figures were truthfully given to Mr. Wright, there seems to be in this industry none of the inducement for expansion usually furnished by large profits. The cost of labor ranged from $1.38 to $1 54 a ton, making it hardly a determining factor, and the demand for higher wages, which threatens to be widespread in the industrial world this Summer, lessens the probability of any decrease of the labor cost of steel production. The figures given for cost of materials, $21.10 to $25.11, are, of course, in their last analysis in great measure a labor cost. Apparently, therefore, the only reduction of expense must be in improved methods, wholly new inventions, or the utilization of cheaper sources of supply.

Though, of course, inventions or improvements may be looked for, effects like those of the work of Bessemer, Kelly and Siemens are hardly to be expected. In the matter of cheaper source of supply, however, there is promise from the South. The report already mentioned indicates that the Southern cost of pig iron ranges from $9 16 to $10 61 per ton, against $13.97 to $16 50, in the North. It would seem, then, that the answer to the question of reducing the cost of steel rests mainly with the South. That region may, in this decade, surprise the world as much in the matter of steel, as in the last it did in the matter of iron. The Chattanooga *Tradesman* voiced this feeling when it declared the most important industrial event in the South, in 1890, to have been the establishment, at Chattanooga, of the Southern Iron Co.'s basic steel plant.

The first basic steel made in the United States was produced experimentally at Steelton, Pa., May 24, 1884, in a Bessemer converter, but its manufacture as a commercial product dates only from March 28, 1888, when the first basic open-hearth steel was produced at the Homestead Steel Works of Carnegie, Phipps & Co. The process was continued there, and last year eight more open-hearth furnaces were built. It is also now regularly carried out at Steelton, and steel has also been produced by it at Pottstown. Last year it was produced in the South by the Henderson Steel & Manufacturing Co., at Birmingham, Ala. The total production of basic steel in the United States in the year ending June 30, last, was 62,173 tons, three-quarters as much as by the long-established crucible process with its 47 establishments. In Great Britain and on the continent the basic process has been received with great favor, and large quantities of basic steel are made annually by all the leading iron and steel producing countries abroad. The growth of the steel industry of Germany and Luxemburg in recent years has followed the introduction of this process, their iron ores being especially suited to it. W. H. Hassinger, a Birmingham rolling mill manager, says that the cost of producing basic steel in the South has been shown to be $21.23 a ton. This has been criticised as too high, being about $10.75 above the cost of pig iron, but $4 25 of this excess is said to be due to the small plant, costly handling of materials and inexperienced hands. Mr. Hassinger thinks he is justified in claiming that basic steel can be made in Birmingham with a well equipped plant for less than $20 a ton. He says that the cost of making this same quality of steel in Pittsburgh by the acid open-hearth process is in the neighborhood of $43.

At a recent meeting of the Cleveland Institution of Engineers, in England, a paper was read by James Davis, of the Park Gate Iron & Steel Works, in which he showed that basic open hearth steel is being regularly produced which stands the Admiralty, Board of Trade and Lloyd's requirements. While the basic process is applicable to either the Bessemer or open-hearth process, its use in connection with the open-hearth furnace is the most successful, and it is the basic open-hearth steel that may be expected to be the important product. To put it broadly, Bessemer steel is best adapted to rail-making and kindred purposes, while open-hearth steel has found its most general use abroad in shipbuilding. The production of open-hearth steel in the United Kingdom, in 1889, was 1,803 712 tons, of which it was estimated 631 944 tons were used in shipbuilding. In the last dozen years steel has almost superseded iron for naval construction in Great Britain, the use of iron having dropped from 310,614 tons in 1878, to 38,677 tons in 1889, while steel went up in in the same time from 2,682 tons to 631,944. The steel and iron figures together show an increase in their use for shipbuilding from 312,296 tons in 1878, to 670,621 in 1889. Here, then, we find one possible outlet for the increased steel production of our own country that may be anticipated in the next decade—that is, for use either in English or American shipyards. If the foregoing estimate as to the cost of Southern basic open-hearth steel is correct, it may yet undersell English steel in the English market. Commissioner Wright's figures showed the cost of producing a ton of steel rails in Great Britain to range from $18.58 to $21 90. Even England may find it hard to counterbalance the natural advantages of the South in respect to its location of mineral deposits, and in neutral markets at least the future steel-makers of Alabama, Tennessee and Virginia may be at no disadvantage.

We exported in the year ending June 30, 1890, 18,458 tons of pig iron almost wholly to Canada, about 1,000 tons of bar iron, 1,103 tons of railroad iron and 9,133 tons of steel rails. In the same time we imported 1,157,395 tons of iron ore, 147,772 tons of pig iron, 36,727 tons of scrap iron, about 32,000 tons of bar iron, and about 50,000 tons of steel, in ingots, blooms, etc. A reversal of the figures of steel exportation and importation would dispose of some of the surplus product which the United States is likely to have, but after all a mere reversal like this would be a trivial matter. Our foreign trade in iron and steel, moreover, is not likely to grow fast enough to keep pace with the present rate of increase in production.

Half of the Bessemer steel now produced is used for steel rails. The demand for these is in no considerable degree influenced by the price, so that a diminution in cost of production is not likely to increase the purchases, railroad building depending on other influences. Contracts have recently been closed by the government for about $7,000,000 worth of steel for armor plates, but such calls for steel will not be regular, and may not be frequent. Steel ship-building, however, is likely to increase, and steel may perhaps soon be extensively used in car building, and doubtless the cheaper it becomes the wider will be its applications in all kinds of industries. Nevertheless, it hardly seems possible that the present decade will see the 290 per cent. increase in steel production that has made the decade of 1881-90 famous in the history of our manufacturers.—[Bradstreet's.

The Steel Rail Outlook.

When we last wrote the rail market was in a condition bordering on demoralization, and it was probably only the prospect of an early sharp decline which prevented a heavy business. On Thursday, however, the first efforts were made to bring about an adjustment of the trivial differences between the Lackawanna and Scranton companies, and yesterday the papers were finally signed which make their consolidation an accomplished fact. As we have repeatedly explained, it was only this which stood in the way of putting into force the agreement of the mills entered into provisionally some time past. That agreement does not attempt to fix the price at which the mills must sell. It provides merely for an allotment by fixed percentages, each month's aggregate sales, at the end of the month, being distributed in accordance with those percentages. An excess is paid for by the mill, while a deficiency entitles the works to an allowance at a fixed rate per ton. While it is certain that the arrangement will not add a ton to the demand, it is equally certain that it will not reduce consumption by more than an insignificant fraction. It will prevent ruinous slaughtering of prices, but will not allow any undue advance in them. There can be no complaint among consumers of the price, $30 at mill or $30.75 at tidewater, which is now generally asked, since it is as low as is consistent with a fair profit to the mills. The cost at Eastern works, with partial employment and at present cost of raw material, is generally estimated in the trade to be $27 @ 28, which leaves a moderate profit on investment and a fair allowance for depreciation of plant. During the week there have been sales by Eastern mills of about 15,000 tons in small lots. We quote $30.75 at tidewater.—[Iron Age.

STATISTICS show that for short distances, as 1,000 yards, wire cables furnish the most efficient means of transmitting power, but for greater distances, as 5,000 yards, electricity is by far the least wasteful of all methods.

ANDREW CARNEGIE ON THE IRON SITUATION.

Mr. Andrew Carnegie has just submitted one of his characteristic interviews to the press, from which we quote:

"The iron trade," said Mr. Carnegie, "is, as you know, the jumping-jack of business, the king or the pauper. The production and consumption of iron and steel last year were phenomenal. We are a great country, but even the Republic is not able to consume 10 net millions of pig iron per year. My forecast was that the extraordinary consumption would continue until the coming Fall. Everything seemed promising, but two causes intervened—first, shortage of crops, and second, foreign financial troubles—and a halt was suddenly called, which otherwise, I believe, would have been postponed; but had it been postponed, it would have been much more serious.

"We shall recover from it sooner than expected. Good crops next year may set us all right again, provided matters don't grow worse in Britain, which I must say, are very unpromising at the present."

"If concessions were made in raw material, and the cost of production was reduced by lower freights, is not that in itself an indication that prices might be reached even lower than they are now?"

"Yes, certainly; we have not yet reached bottom prices, in my opinion."

"That holds good of raw material, Mr. Carnegie?"

"Yes. Beginning with the raw material, prices were unduly inflated for ore last year, because some of us believed—and I was one of them—that it was impossible for this country to produce enough Bessemer ore, and also to furnish the amount of iron and steel that it seems probable this country would want, inasmuch as Europe was fully occupied with its own demands and those of the world. For the first time in the history of America the question had to be solved, can the United States furnish all that would be required in iron and steel during a busy period? I did not think it would be able to do so last year."

"Was there not last year a tremendous general demand, upon which there did not come any additional and exceptional demand for railroad material? This is to say, the demand for rails was only normal?"

"The demand for rails was normal; slightly more so. I don't believe this country will take as many rails as it did last year, upon an average, for a few years to come. There was a slight excess in the demand for rails, and an enormous demand for everything else."

"To what extent will it be possible to enlarge the demand for our home ore in the East, and in that way meet foreign ore? Will not the domestic be relatively cheaper than the foreign ore?"

"I don't think it will be found much greater than it was last year. You must remember that depression has come in Europe; not to the full extent which will be reached, but prices are steadily going down, ore will fall with it, transportation rates be reduced, and I think foreign ore will hold its own in the East this year."

"What prices do you think we will reach for ore?"

"Well, I see they are talking of $1 a ton less than last year's prices. This would bring them down to the prices of the year before. But I think in every depression a lower point is reached than in a previous one, because of improved methods of mining, and certainly very much cheaper transportation on the lakes. So that as far we are concerned, we would not be willing to contract for ore at the prices of 1889. I believe that prices will fall lower, just as I say that prices for billets and plates and miscellaneous articles will fall a shade lower than they were in 1889."

"Mr. Carnegie, what is the outlook in coke?"

"The coke business is a thing by itself. For years coke was sold for less than cost. It is a curious business. As long as poor operators can get enough of cash for their coke to pay their labor, they will sell rather than blow out ovens. They take no account of the coal and the fact that they are exhausting it, nor of the total loss of plant which comes when the coal is exhausted; they are like drowning men, and will sacrifice everything to keep afloat for the time. This state of affairs rendered the coke business ruinous."

"Mr. Carnegie, do you think the prices at which coke has sold for in the past any criterion as to what it may sell for in the future?"

"Very far from being a criterion. No business will be conducted very long that does not yield a fair profit. Now, it was a matter of life or death with us either to get the coke business on a better basis or to continue sacrificing our property until we had driven out the others, and so far had losses gone that we were able to purchase many of the properties of our competitors. Instead of continuing the ruinous policy, we have tried to reap a profit from the business, but the community has been spoiled by getting Connellsville coke at prices lower than it could be made. The value of coal lands has more than trebled in recent years. Coal that we formerly had for $100 an acre now we have to pay $500 for. Labor has risen, and at present prices of coke the concern that makes a fair margin is doing very well. For my part, I should vote rather to let our coal remain in the ground than to sell it under the present prices."

"To what extent, Mr. Carnegie, have the railroads shown a disposition to meet the exigencies of the case at the present time?"

"Well, I think the present ore rate from the lakes to Pittsburgh is a fair one. It is not as low as competition has forced the rate from the lakes to Chicago; but I am bound to say from my own experience that it is a fair rate and that we are not justified in asking the railroads to go lower."

"How about coke rates, Mr. Carnegie?"

"Well, the Pennsylvania railroad people heretofore considered coke a plum and have exacted rates for its transportation which bear no relation to rates upon other things. They have discriminated against Western Pennsylvania, their own home traffic. If the Pennsylvania Railroad takes a train of our own cars from our own mines to Pittsburgh and places them upon our own sidings, it charges to Pittsburgh 72 cents. The cars are not theirs; all they have to do is to put the engine to the cars and haul them to Pittsburgh. If this is coke for Pennsylvania manufacturers it is charged 72 cents a ton. They will make the same train of cars, haul it to Pittsburgh in the same manner, and if it is destined to other States they will charge only 52 cents a ton. It is a mistaken policy, embitters everybody who knows about it, and in the interest of the railroads it should no longer be. I am in hopes that the present severe trials that Western Pennsylvania is undergoing, especially in the Shenango and Mahoning Valleys, will lead railroad officials to consider this question and place coke upon a fair basis. I am sure that it would be to the mutual advantage of the railroads and manufacturers and would remove the last serious cause of hostility and feeling of antagonism between the two which should not exist. The rate to Pittsburgh on coke should be the same as it is upon coke destined beyond Pittsburgh—52 cents per ton; the rates to the Valley 1 cent per ton per mile more."

"What will the outcome be of any prolongation of the coke strike which is now on, Mr. Carnegie?"

"Well, you know that I have retired from giving attention to business. I have not thought of business for some months and don't intend to think much about it hereafter. I don't know the particulars of the coke dispute. All I do know is that it is the wrong time for labor to choose for making a demand for higher wages, to increase the cost of an article which we have great difficulty to dispose of at very greatly reduced rates. Leaders of labor don't seem to possess good sense in choosing their battle-field and the time for a struggle with their employers. This is no time to increase the cost of anything. Men will learn that it was right when I said that labor will never get its fair proportion of profits except by a fair sliding scale—that is the true plan. When prices go up labor should participate in the advance; when prices decline it should bear its share in the decline. In this way labor and capital are not enemies but allies, standing shoulder to shoulder through good and bad times. I know that a sliding scale at Edgar Thomson and Homestead has cost our firm a good deal more money than it would have had to pay without the sliding scale; but if we get less profit we are fully repaid in the greater satisfaction we have in feeling that our men and ourselves are in the same boat, pulling together."

"What is the very considerable difference between the selling prices of rails and soft steel due to, or, rather, why is apparently the soft steel trade in so far much worse a condition than the rail trade?"

"One reason is that no concern runs upon billets as the one article from which they derive profits. Concerns make 100 different things from their steel; not being able to sell all the steel they can make, it is better for them to run their Bessemer works to full capacity, which cheapens the product, and sell part of the product in the shape of billets. Besides, rails cannot be made nearly as cheap as billets, in which there is no inspection, drilling, or finishing."

"We have a telegram, Mr. Carnegie, that the men of the Allegheny mill will not strike."

"Now I am not attending to business at all; having nothing to do with it, but I know when I was consulted about buying the Allegheny works it seemed that we should have to close them, and I was very sorry to think that our firm should ever buy a works and have to throw men out of work, even if we had to run it without a cent of profit, although it is almost sure that if we had not bought the works they would have stopped. I was delighted when my partners told me they were going into the market to take billets at any price to give the men work. Whenever the men want to stop the works the firm won't be sorry. Any time they should so decide we should be only too glad. Making billets at the price we have had to, is not as good for the firm as to sell the pig at present prices. Besides this, I hear that the men at Allegheny are making high wages, owing to the great product. This is a splendid opportunity to let the men have their own way, running the works or stopping them. We pay the money and they take their choice. But I should like to say this to working men: 'Gentlemen, this is no time to quarrel with your employers. Take the best you can get, be quiet and thankful that you are not idle.'"

"When is Edgar Thomson to start?"

"Well, really, I don't know what Mr. Frick has decided. I understood when he was here that we had no orders. Repairs are complete, and we could start to-morrow, but there are no orders in the market. If we don't start until July we could make all the rails we shall get this year."

"Homestead, as I understand it, Mr. Carnegie, has facilities for making 17-inch armor plates?"

"We have no doubt of it. I think they go to 20 inches. We have the most powerful rolling mill in the world, and our hydraulic press is being put up. It has arrived, and is now being erected."

"When you were abroad, Mr. Carnegie, what did you find?"

"The situation is very much as it exists here, and the cause is the same. The world is so closely interwoven, one part with another, that nothing very serious can happen in Europe which cannot effect us here, and *vice versa*. The financial trouble, which culminated in the Baring disaster, is not yet healed. The load has been taken upon the shoulders of the leading financial houses, but it remains there. You see from the papers that several other houses are in trouble, and that one of the guarantors of the Baring deficiency shows signs of wavering. If one withdraws, the heavy load may affect the others. It is a very serious situation. Even if it is all quietly settled without an explosion, we cannot look for further railway extensions in any of the South American States, for a good while to come. The loss of this market to Great Britain will depress prices, and already you see quotations lower and lower. This, in its turn, will affect our market, not so much from direct importation of iron and steel, as from financial causes. Few new bonds can be disposed of, and therefore our railway extensions for this year would be very small. We are in for a quiet time. The iron and steel manufacturers of America may safely regard this as an 'off year.' Those who come out whole can celebrate Christmas with thanksgiving."

LAKE SUPERIOR MINING NOTES.

VERMILION AND MESABA RANGES.

We learn that the company now working the Anderson, have leased 160 acres of land adjoining this property on the north, and the Lockhardt property on the south. A large crew is expected to be put on, and the land thoroughly explored by means of test pits. Considering the outlook and the prospects at the Anderson, it would not be surprising to see this new property open up in a satisfactory manner.—[Ely Iron Hone.

MARQUETTE RANGE.

The Braastad is a combination of what was formerly the Winthrop and Mitchell, and locally these distinctive names are still preserved. The company is working 275 men. About 30,000 tons of ore are in stock. Sinking is going on in a new shaft on the Mitchell, which is to take the place of A shaft. It is 7x16 feet, and is down 150 feet. Nos. 2 and 3 Winthrop shafts are down vertically 300 and 90 feet respectively, the latter being bottomed in the soaprock now. The diamond drill located the ore in No 2 at a depth of 280 feet, and in No. 3 at a depth of 180 feet. Hoisting is going on in A shaft Mitchell, and No. 4 Winthrop.—[Florence Mining News.

The grade at No. 2 shaft of the Saginaw mine is very high, running iron 68 16; phosphorus, .046; and silica, 1 40. It is very hard ore, about as hard as pure iron. The diamond drill has located a lode of softer hematite. On the fifth level, near the west breast of the drill, the miners opened into the hanging, and in eight feet came into a lode which extends in line with the first, east as far as the shaft and its upper margin overlapping the other. East of the shaft the hanging raises up, and the ore lays off flat to the northward.—Florence Mining News.

MENOMINEE RANGE.

The owners of the Sheridan mine, in the Iron River district, are jubilant over recent developments at their property. The shaft is located in the hanging wall side of the vein. The ore from the new find runs up to 65 per cent in metallic iron and is about even with the Bessemer limit in phosphorus, an ore that will find a market if one is to be had. The ore is very similar in appearance to the product of the Mansfield, the wonderful Bessemer producer of this district.—[Diamond Drill, Crystal Falls.

The *Iron Mountain Range* says John Minnis and others, who have been exploring on section 8, 36-19, at Spread Eagle, this county, report encouraging prospects. They are sinking a shaft which is now 27 feet deep and is all in ore. Exploration and test-pit work show that they have an ore deposit of considerable extent and in the Spring a company will be formed and stock placed upon the market. The first ore taken from the shaft was found to run 48 per cent. in iron, but as sinking progresses the quality is said to improve very much. Drifting at the Wagner property has commenced. The main working shaft is down 125 feet and it is at this depth the new work is being done. They are drifting north toward the Tobin in a formation of iron and jasper.—[Florence Mining News.

GOGEBIC RANGE.

Considerable amount of development work has been done at the Sunday Lake mine, says the Bessemer *Pick and Axe*. The two shafts have both been sunk two levels below the old workings. At No. 2 shaft the cross-cut on the seventh or lowest level has just been completed into the ore, the first sample of which shows 68 20 per cent. in metallic iron, which is the highest grade ore yet found on the range. At No. 1 shaft in addition to sinking to the second new level a cross-cut has recently been run to the northward on the sixth or 355 ft. level. It is at the end of this cross-cut at a distance of about 60 feet from the "hanging" of the old deposit that the rich find has just been made of which the report has been quite extensively circulated. The ore taken from this new vein of lens assays 67 85 per cent., and like the other runs very low in phosphorus.

A small pocket of excellent ore was struck this Winter at the Alpha, at a depth of 175 feet. The shaft penetrated the find a distance of seven feet and is now on mixed ore.—[Florence Mining News.

After the discovery of ore at Chicago, a new shaft was laid out at the Alpha, on the line between the Chicago and Brotherton. This shaft is now down 125 feet, in a mixed ore formation. At a depth of 115 feet a pocket of fine grade of ore seven feet in thickness, was struck —[Florence Mining News.

At the East Dangler the shaft is down 94 feet and bottomed in mixed ore. Miners have struck and gone through several small pockets of fine ore. The formation is broken, but looks well. On the east half and southwest quarter of section 8 work is being commenced. They are test-pitting, but will soon put on a diamond drill.—[Lake Superior Democrat.

The management of the Crown Point are still extending the cross-cut south from the bottom of the old No. 1 shaft at a depth of 95 feet. The cross-cut is in 190 feet, breasted in mixed ore. It will be continued from 200 to 300 feet farther, unless the vein is struck sooner. The prospects are good.—[Florence Mining News.

The Architectural Application of Iron and Steel.

Of course, the question will have to be considered not merely from a utilitarian, but also from an æsthetic point of view, and in approaching this less familiar ground, an engineer will naturally be unwilling to rush in where angels fear to tread; but there are perhaps a few common-sense principles which may safely be referred to. In the first place every architect is the born enemy of shams, and if we are seeking to discover the true outlines of a style of iron construction, we must at once set aside every device for disguising the real nature of the material. Massive entablatures and cornices of hollow cast iron can only be regarded as hollow shams, and constitute an offense against good taste, which has been perpetrated often enough, and which reached its greatest extreme, perhaps, in certain buildings that were run up in America, where the entire Gothic facade, with its deep reveals, recessed and richly moulded archways and supporting buttresses, were all done in cast iron about half an inch in thickness.—[Iron and Steel Trades Journal, London.

Reduction in Western Freight Rates on Iron.

A Chicago special to the Pittsburgh *Dispatch* says the reduction of 2½ cents per 100 pounds in the freight rates on iron between Pittsburgh and the Mahoning Valley and Chicago, which has just been agreed to by the Central Traffic Association, is the outcome of a long fight which has been in progress since early last Summer. While Pittsburgh shippers of manufactured iron will greatly profit by this change, the chief beneficiaries of it are the pig iron manufacturers of the Mahoning Valley who, during the past year or two, have suffered severely from the competition in Western markets of Southern furnaces, which, with cheap coal and coke and limestone at their doors, have been able to manufacture iron at as low a figure as $11 per ton, whereas, in the Mahoning Valley and Pittsburgh the cost of manufacture is nearer $16. "The present cut," said a Mahoning Valley man, "will afford us only temporary relief, for the Southern men with their superior facilities will undoubtedly make a reduction in prices which we shall be unable to meet. They have made a large hole in our trade in the Western market, and they will do everything in their power to hold on to what they have got. The cost of the coal from which coke is made has not increased. The process of making coke has perhaps been cheapened somewhat because it is made on such a large scale, and the only reason for the increase in the price is in the greed of the combination of capitalists represented by H. C. Frick, of Pittsburgh, who own three-fourths of the ovens in the Connellsville region, and fixes the price. The Southern manufacturer of pig iron pays perhaps $1 for his coke, we pay $2 25, and yet are expected to compete with him for the Western market. Mr. Frick, and Mr. Carnegie behind him, are the men who are really responsible for the serious inroads which have been made on our trade by the furnaces in the South. It takes approximately a ton and a half of coke to produce a ton of pig iron. The reduction of 20 cents per ton in the freight rate is, therefore, equivalent to a reduction of about 13 cents per ton in the cost of coke; that is all. If the grip of the coke combine could be broken it would be a great aid to the iron industry of Western Pennsylvania, and Ohio Southern competition would not trouble us then."

Electric Welding of Pipes.

In welding together pipes by the electrical method it has, says the *Scientific Press*, been the usual practice to employ internal mandrels to prevent collapse or change of circumferential outline. Professor Elihu Thomson, however, has recently invented a simple process by means of which the use of internal fixtures is avoided. The invention is based upon the fact that if a hollow structure be heated at a certain portion of its length and subjected to an upsetting action, it will bulge exteriorly instead of collapsing. The structure will, therefore, have a larger diameter at the swelled portion. In the present process, where it is applied to the welding of pipes, hammer blows are delivered at the weld or on the side of the pipe, and are so graduated as to simply contract this bulging or lateral spreading tendency. The hammering is delivered laterally so as to restore the metal back to its original position on the sides of the pipe. There is no tendency to collapse on account of the bulge of the pipe acting as a sustaining support.

Effect of the Postal Subsidy.

It will mean establishment of American steamship lines to the River Platte, as we pointed out last week. It will mean faster and larger ships in the Brazil line. It will mean the building of the finest ships ever built in America to compete with the fine ships of the Canadian Railroad system out of Victoria, B. C. It will mean the establishment of a steamship line to Southampton—ships that will give England a start—ships that will mark the beginning of the downfall of England as the greatest maritime nation in the world. It will mean that an increase in size and speed of all steamships now engaged in the foreign trade will at once commence—it will mean that all the benefits which the bill affords will be utilized. It will have the effect of educating Americans to the possibilities of our maritime greatness, and, possibly, result in bringing to a future Congress' attention the fact that aid to American shipping means prosperity in all American homes.—[Seaboard.

The Manchester Ship Canal.

The sub committee appointed by the Manchester corporation to consider the request of the Manchester Ship Canal Co., to assist them in the promotion of their undertaking, have issued their report, which will be considered at a special meeting of the council to be held on Monday next. The committee state that they have made thorough and independent inquiry into the position of the undertaking, and have carefully considered reports submitted by their own engineers, and also those of the canal officials. They find that up to December last over £9 000,000 had been spent on the canal, and that £3,900,000 are still needed to complete the works, giving a total expenditure of about £13,000,000 The total resources of the company appeared to be £10,900,000. The committee are of opinion that a sum of £2,500,000 will be sufficient for them to advance, but they are advised that it would be prudent that borrowing powers should be sought by the corporation for £3,000,000.

THE railway line up to the Supergna, at Turin, is worked by a rope consisting of six plies of 8 wires each, or 48 wires in all. Tests from 8 single wires from one ply gave a breaking load of from 908 to 1,060 pounds, equivalent to from 83 5 to 97.4 tons per square inch. The breaking load of the remaining five plies were 91 1 to 101.1 tons per square inch. Taking the net sectional area of the rope at 0 225 inch, and the lowest result above given as the average, the total breaking weight of the rope would be 19 3 tons per square inch.

GERMAN IMPRESSIONS OF AMERICAN INDUSTRIES.

London *Industries* say that "the Iron and Steel Institute on its recent American trip was, it will be remembered, accompanied by 140 representatives of the Society of German Ironmasters. It is interesting, therefore, to note that at the general meeting of this society, at Dusseldorf, a complete record of the excursion was laid before the members who were not fortunate enough to be able to take part in it. The reports were intrusted to various members, a general introductory narrative of the trip being furnished by Mr. A. Thielen, who acted in America as president of the society. The report on American blast furnace practice was written by Messrs. J. Schlink and A. Schilling, and that on rolling mills, by Mr. A. Spannagel. The remaining reports were postponed until the next meeting. The list includes reports on the Northern excursion, by Mr. H Brauns; on steel manufacture, by Mr. R. N. Daelen, on metallurgical machinery, by Mr. E. Klein; on foundry practice, by Mr. Haedicke, and on railway practice, by Mr. Macco. The meeting excited considerable interest, and was attended by some 600 members.

"In the introductory address Mr. Thielen gave an interesting account of the whole excursion. When the party divided at Chicago, 45 of the German visitors selected the Northern trip, and 60 the Southern, Mr. Thielen selected the latter. The impression the iron industry of the South made upon him was very variable. In some places he saw the very latest improvements; in others, however, he saw nothing but antiquated practice, frequently with the evident object of earning money as rapidly as possible, with the least expenditure of capital. Financially, the industry is not nearly in such firm hands as that of the North. Indeed, there can be little doubt that many of the mines and works are still in the hands of speculators, ready to sell at any moment. The cost of production of the iron ore is 2s. per ton. Coal, usually of good smelting quality, is obtained quite as cheaply. There is an abundant supply of negro labor, and the climate is apparently not unhealthy. It is thus evident that the cost of production of pig iron cannot exceed 26s. to 51s. 6d. per ton. The pig iron contains 2 to 3 per cent. of silicon, and 0 4 to 0.6 per cent. of phosphorus, and is now used almost exclusively for foundry purposes. There is no doubt, however, that with proper application of modern processes, steel of good quality might be made.

"In his report on the production of pig iron in the Northern States Mr. Schlink began by pointing out the rapid growth of the American iron trade. The production of pig iron in the United States, in 1889, amounted to 7,725,755 tons, compared with 8,377,261 tons in the United Kingdom, and 4 525,000 tons in Germany. He then discussed the sources of iron ore supply, and described some of the leading iron works. The enormous daily output of 335 tons from one furnace, as obtained at Carnegie's works, is, he points out, the exception and not the rule. In 1889, there were in the United States 169 furnaces using coke in blast, the average daily output being 101 tons, while that of the anthracite furnaces and of the charcoal furnaces were 58 and 28 tons, respectively. These are figures that need cause no anxiety. All the large American works are intended for the production of rails. It would be impossible to adopt American practice in German works, as the pure ores are wanting, and there would not be sufficient demand for the rails produced. The Lake Superior ores, it will be remembered, contain 6 to 8 per cent. more iron than the Spanish 'campanil,' now unfortunately unavailable. In conclusion, Mr. Schlink points out that the daily wages of furnacemen at the South Chicago Works average 8s. 8½d. The wages, with a furnace producing 175 tons daily, amount to 4s. 5d. per ton, whilst with smaller furnaces they increase to 6s. and more.

"In his report on the iron industry of the South Mr. Schilling pointed out that it was not so highly developed as that of the North, coke blast furnaces having been in operation for not more than 12 years. At Birmingham, in Alabama, the center of the industry, iron ores, coal and limestone occur in close proximity. The ores smelted are partly red hematites (red iron ore and Clinton ore) and partly limonites. The former of chief importance. They occur in Silurian limestone, and have the following percentage composition:

	Soft ore.	Hard ore.
Silica	15 to 18	8
Aluminum	3	5
Lime	1	28
Phosphorus	0.26 to 0.9	0.2 to 0.8
Iron	48 to 52	40

"The ore is mined by contract, 1s. to 1s. 8d. being paid per ton for soft ore, and 1s. 8d. to 2s. 6d. for hard ore. The brown iron ore contains so much admixed clay that it has to be washed. It then contains 46 to 52 per cent. of iron. The coal of the Warrior coalfield is 6 feet to 14 feet thick, and the coke obtained from it contains a considerable quantity of ash. The operatives at the mines and works are almost exclusively negroes, who are found to be unintelligent and difficult to deal with, as they will not work except to obtain the bare necessities of life. The wages are 4s. to 6s. per day. In conclusion the various blast furnaces throughout the region are described, and the rapid development of the iron industry pointed out. In 1878 the first coke blast furnace was built. Now Alabama produces 780,000 tons of pig iron, of which quantity the Birmingham district yields 75 per cent.

"In his report on the American rolling mills Mr. Spannagel gave a lengthy account of the various works visited. The enormous advantages presented by natural gas in the Pittsburgh district were pointed out. The gas is paid for, in the case of puddling furnaces, at the rate of 6s per ton of iron produced, and in the case of boilers at the rate of £10 to £20 per month At the Pennsylvania Works at Pittsburgh, the consumption of gas amounts to 182 400,000 cubic feet daily, the quantity of coal thus replaced amounting to 10,000 tons. In conclusion, Mr. Spannegel discusses the rolling of tubes in the United States. As it was not permitted to visit these works, his data are based on observations made by Mr. Bendix Meyer, director of Huldschinsky's Tube Works, at Gleiwitz. The American works, he considers, are in advance of the European ones in many points, notably in the amount they produce. He estimates the daily production of the chief works to be as follows:

	Tons.
National Tube Works	500
Pennsylvania Tube Works	250
Mc Clean Tube Works	200
Pittsburgh Tube Works	250
Reading Tube Works	200
Total	1,350

"This total is exclusively gas and oil pipes, and is about five times as great as the production of all the German works. Whereas, in Germany the lap-welded pipes are usually sent three times through the rolls, in America it is found sufficient to weld the pipe in one heat, and then to pass it for calibration through rolls placed at the side.

"An interesting discussion followed the reading of these reports. Dr. Wedding described various methods of transporting and loading material, notably at South Chicago Works, where ore has to be transported from the ship to the works in sufficient quantity to yield 1,600 tons of pig iron daily. The plant employed for this purpose was constructed by the Brown Hoisting Co., of Cleveland, O. The greater portion of the discussion that followed related to the comparative cost of labor in Germany and America."

Two Obstacles to Our Foreign Trade.

The fact that money has been pouring into the Treasury, at Washington, pretty freely of late, leads the *Southern Merchant* (Nashville, Tenn.) to observe that a surplus will not be in the way. For instance, the editor says, the improvement of our merchant marine can not too soon receive consideration. The editor of our contemporary, Mr. Albert Roberts, after having been engaged for several years in the study of public questions, as the editor of a leading Southern daily journal, was appointed by President Cleveland to a consular position, so that he brings to the profession of trade journalism, a wide familiarity with subjects bearing upon international trade.

The *Southern Merchant*, however, does not regard American ships alone as sufficient to place our export trade upon the proper basis. A serious obstacle to the sale of our goods abroad, it adds, is the lack of banking facilities. It is in this matter that England enjoys advantages over the United States, London banks having working branches in every important city in the world. On the other hand, a foreign buyer of unlimited means and good credit in his own country, may order goods from an American manufacturer, enclosing a draft on himself, but because he is unknown here the manufacturer must hesitate to honor the draft. In such a case it is plain what would be the advantages of branches in principal foreign capitals of American banks. As a rule, it is safe to assume that foreign banks are no more favorable to the extension of American trade than are foreign shipping companies. It is not long since *Hardware* called attention to the fact that it costs more to remit a given sum from Rio Janeiro to New York than to London, the advantage of the latter city being due to English banking facilities in Brazil.—[Hardware, New York.

Electro-Plating.

Mr. Scott A. Smith, of Providence, R. I., has recently written a monograph upon electro-plating, which the Gorham Co. has published. The interesting contents are inclosed between tasteful covers, and the printing is in line with the artistic work of the company, in silver. To quite appreciate the book requires in the reader a knowledge of electricity, and familiarity with the progress that has been made toward the control and utilization of the subtle substance, for Mr. Smith contends that it is a substance. Yet the layman, especially the layman with a mind open and anxious for the reception of electrical knowledge, may profit greatly by its perusal and study. Mr. Smith attempts in his introduction, which is the larger and better portion of the book, to tell what electricity is. It is an undertaking which is not courted even now by electricians, much less by men of ordinary culture in the various sciences. But Mr. Smith essays to show that electricity is a substance, which is a revival of an old theory, with new evidence to support it. The usual scientific definition of electricity has been that it is "form of motion." We cannot attempt even to indicate the line of argument employed to set upon its feet once more the old theory, but it is placed upon its scientific pedals, with precision and plausibility, to say the least. The little book—it has but 35 pages all told—is an admirable example of condensed statement. It might easily be expanded into a 200-page volume, and probably readers will all wish that some of its trenchant statements had been elaborated somewhat. Its author has received some very handsome commendatory letters from expert electrical students, and has the satisfaction of knowing that they coincide with his views. —[Providence Telegram.

Still Harping on the McKinley Bill.

The annual meeting of the shareholders of Joseph Rodgers & Sons (Limited), the great cutlery manufacturers, was held at Sheffield, on February 17. A dividend of 12½ per cent. was declared, after writing off £1,000 from the good-will account, and carrying forward £1,688. Alluding to the McKinley tariff, the chairman stated that he anticipated a further falling off in the company's trade with America, during the current year, to meet which the directors recommended the carrying forward of a larger balance of profit than usual.

"The Sheffield of Sweden."

The Swedes have also become very skillful in the manufacture of cutlery. The town of Eskilstuna, lying not far from the western end of Mælar Lake, is now widely known—and deservedly, too— as "the Sheffield of Sweden." Here are situated a dozen or more factories, which turn out the finest cutlery and tools. Eskilstuna razors, pen-knives and scissors are well known and highly prized in almost every country of the globe.—[W. W. Thomas, Jr., United States Minister to Sweden.

THE "SILICA PROCESS," IN IRON AND STEEL PRODUCTION.

Most of the different processes of manufacturing iron and steel are well known to all interested in iron or steel production, or in the use of iron and steel in manufacture. Among these processes one of the latest candidates for the favor of manufacturers, is what is know as the "Silica Process," which was invented and first brought to notice by Captain George G. Mullins, of the United States Army, and which is now being extensively introduced by the Mullins Silicated Iron & Steel Co., of Chicago, who have offices in room 219 of the First National Bank Building.

The silica process, we may say, is a simple and novel use of comparatively pure silica, as a helper in the manufacture of superior iron and steel, and by "silicated iron" is meant that the metal has been especially treated with silica in order to improve it. This process needs no special plant nor any additional machinery, and is not confined to any particular part of the iron industries; but is equally applicable to all other processes for the production of cast iron, wrought iron, steel and cast steel. The inventor of the "silica process" was the first man to discover that there is a regular and scientific way in which to use silica as an alloy to help purify, change and strengthen metal—to render both iron and steel homogeneous, fine grained and comparatively free from porosity. It took years of study and experiment, and much money to perfect the silica process, but now it is a success, and is patented in the United States, Canada, England, France, Spain, Belgium and Russia.

It is impossible within the limits of such a notice as this to enter into the details of this new and remarkable process, or even to explain the chemical action of the silica, but it is sufficient to say that the process increases transverse and tensile strength, decreases shrinkage, makes castings fine-grained, uniform, comparatively free from air holes, and soft and workable. Its use as a purifier and softener in cast iron, will effect important savings in foundry work, and give in machinery castings, a product with the desired greater strength and wearing qualities. The silica process is not an untried and untested novelty or theory, but has been most thoroughly examined into by professors and experts in metallurgy, and is now in constant use in many of the leading iron works and foundries of the country. The controlling company have, in their possession, many testimonials from experts and foundry managers. Space prevents us from giving more than a sample of these. Professor Johnson, of the department of civil engineering, of Washington University, St. Louis, writes to Capt. Mullins, as follows:

"I herewith submit a summary of the results of tests on cast iron, made by me for the Mullins Silicated Iron & Steel Co., at the Washington University Testing Laboratory. The specimens were brought to me, in the rough, being 1¼ inches in diameter and some 14 inches long. They were turned down at the laboratory under my direction, and tested on a Riehle 100,000-lb. testing machine of the latest improved pattern. The working qualities of the metal were observed, and its appearance on the fractured surface noted. All tests and computations were made by me personally. With a very few exceptions, I was ignorant of the source and composition of the specimens, neither did I know which were silicated and which not, until after the tests were completed. No record of this information was kept by me, however, and you have to-day sent me the information which alone enables me to classify the results into "silicated" and "non-silicated," and also to determine which tests were on identical mixtures. My tests and examinations have been directed to the following properties of the iron: Internal structure, working qualities, tensile strength, resilience."

SUMMARIZED, THEY WERE AS FOLLOWS:

Average tensile strength silicated	25.400
" " " non silicated	20.720
" gain silicated over non-silicated per cent	22.6

RESILIENCE—(Power to resist shock).

Average resilience of silicated	107.5
" " " non silicated	56.6
" gain of silicated over non-silicated, per cent	90

In power to resist crushing strain, average good iron offers a resistance not to exceed, say 80,000 pounds to the square inch; in Prof. Johnson's tests, a piece of silicated is credited with 123 000 pounds to the square inch.

In conclusion, allow me to express my belief that your process greatly improves all the desirable qualities of cast iron, and, so far as I am aware, aggravates no undesirable quality. Very respectfully yours,

J. B. JOHNSON,

Prof. Civ. Engineering, and Director Testing Laboratory.

The Union Foundry & Pullman Palace Car Wheel Works said, on March 7, 1890:

"After a series of very careful trials of Mullins Silicated Iron & Steel Co.'s patented process for the manufacture of iron and steel, we cheerfully pronounce that there is decided merit in it. We have adopted the process and taken license for its use during the life of all the patents in the Union Foundry & Pullman Car Wheel Works, Pullman, Ill. We are now making superior, smooth, clean, soft and extraordinarily strong castings with silicated iron. Please say to all concerned that we must decline, in advance, to answer any inquiries about your process, and refer persons wishing information to the proper parties in Chicago."

The Lake Shore Foundry Co., 347 and 349 Illinois street, Chicago, put it this way: "Having used your process for purifying and strengthening our iron during the past month, we take great pleasure in stating that the experiment has been perfectly successful in every respect so far, and we are satisfied that it is saving us money every day, and greatly lessening the amount of defective castings."

Further evidence of the value of this process is assured by its adoption lately of such well-known firms as Walker Manufacturing Co., Cleveland; E. P. Allis Co., Milwaukee; Filler & Stowell, Milwaukee; Avery Planter Co., Peoria, Ill.; Deere Mansur Co., Moline; Moline Plow Co.; O. L. Ide & Son, of Springfield, Ills., and others.

In view of such unquestionable opinions as the above there can be no doubt that the silica process is a most valuable invention in metallurgy, and that it greatly improves and cheapens all irons and steels. The Mullins Silicated Iron & Steel Co. is officered as follows: George G Mullins, President; Chas. T. Trego, Vice-President and Treasurer; H C. Sparr, Secretary and Assistant General Manager. The company grant licenses for the use of the silica process on royalties only and do not sell shop rights. The cost of the silica treatment is at most but a few cents to the ton. Parties taking license are only obligated to pay for production made by said process. We believe it will pay all who are largely interested in the production, or in the use of iron and steel, to write to the company, as above, for their various circulars and descriptive pamphlets. These give full information of a valuable discovery.

Output of Basic Steel in 1890

We have received the official statistics of the production of basic Bessemer steel during the past year. The total make was 2,603 083 tons, as against 2 274,-552 tons in 1889, and 1,953.234 tons in 1888. This shows an increase of 328 531 tons over 1889, and of 649,849 tons over 1888 This rate of progress must be regarded as highly satisfactory by the royalty owners. The total output of basic steel since the process came into existence is 13,448,000 tons. Of the total make last year, 2,232,639 tons were made by the converter method, while 370 444 tons were produced by the open-hearth process. Of the so-called Bessemer output, 1,593 148 tons contained under 17 per cent. of carbon, and 298 867 tons obtained by the open-hearth process were of similar composition. For the first time the United States figure in the return. The increase are as under:—Great Britain, 9.581 tons; Germany and Luxembourg, 187 270 tons; Austria (given separately for the first time), 26.560 tons; France, 18 246 tons; Belgium, Russia, and the United States, 86.974 tons. Below we give the returns for the two years ending December 31st in each year:—

	1890.		1889.	
	Total.	Under 17 per cent C.	Total.	Under 17 per cent. C.
England	501,400	351 404	493,919	348,828
Germ ny and Luxembourg	1,493,157	1,138,241	1,325,887	1,060 416
Austria	202,315	114,257	175,755	124,907
France	240,038	175.550	222,392	159 27(
Belgium, Russia, and the United States	163 573	111,963	76.599	71,217
	2 603,083	1,8 2,015	2,274,552	1,764,639

We regret to perceive from the returns that only 622,000 tons of slag were utilized last year for fertilizing purposes, as compared with 700,000 tons in 1889. It would be curious to learn the cause of this decline, whether it is likely to be permanent. We observe that the percentage of phosphate of lime obtained from the slag is the same as in previous years, viz, 36.

The Colorado Coal and Iron Company.

Under the management of E J. Bervind, the well-known coal operator, and with the co-operation in the iron and steel department of men familiar with the trade, like F. L. Lehman, of Naylor & Co., and Chester Griswold, formerly of the Troy Works, the Colorado Coal & Iron Co. appear to have taken a new lease of life. When the new management took hold of the property there was a floating debt of over $600,000. While in 1889 there was a deficit of $192,-818 38, the operations of the year 1890 show an increase of $1,469,074 in gross earnings and of $322,003.90 in the net earnings. The actual surplus of the year was $239 987 16, which would allow of a distribution of a dividend of 2 4 per cent. It is deemed more advisable, however, to accumulate a working capital, and put the property on a better earning basis. The sales of real estate, not including in the statement alluded to, aggregate $1,023,583 68, of which $190,-838 68 was cash and the balance on time payment. The expenditures for construction, development and equipment were very heavy, including $93,699 55 in the coal department, $6 821 80 in the coke department, $229 601 36 in the iron and steel department, $10,193.41 in the iron mines, and $65,696 03 in the real estate department. Included in the improvements in the iron and steel works was the building of a cast iron pipe plant at an outlay of $97,582.57, and $72,680 14 on the two furnaces. The company have begun the building of a third stack and will build also a number of Davis-Colby roasting kilns.

The most serious question which has confronted the company for years has been the iron ore supply. Energetic measure were taken to secure it, and at the same time make the company less dependent upon the Leadville mines, of which about one-fourth of its mixture was composed. We understand that the developments during the past year have been of the most encouraging character.

The Smoke Nuisance in Chicago.

The report of Smoke Inspector Young, of this city, published in the *Tribune* of Saturday, gives reason to hope that ere long the dreadful smoke nuisance will be reduced to an endurable state. The railroad-locomotive part of the problem has long been recognized as the most difficult to deal with, but it now appears that the railroad officials see that it can be abated, and many of them are working to that end. Some of the roads have abated the nuisance on all their locomotives which run within the city limits, and some of the rest are making the required changes as fast as they deem practicable. The others report little progress, which may be accepted to mean that they have not entered into the spirit of the proposed reform, and need to be spurred up to a performance of their duty to the community. The Smoke Bureau has decided that sufficient time has been given for compliance with the anti smoke ordinance and that a vigorous prosecution will be instituted against the dilatory ones and see what effect fines will have. This should not be a mere promise, as so many others that have been made, but carried out faithfully. The Smoke Bureau reports that much has also been accomplished in abating the smoke nuisance in factories, hotels, and office buildings, and the clearer skies with which we have been favored in the last few weeks show that this is not merely an idle boast. But there is a vast deal yet to be done before the curse is removed and the air rendered clean.—[Chicago Tribune.

BASIC STEEL MAKING IN THE SOUTH A SUCCESS.

In the course of an elaborate paper in *The Tradesman*, describing the process of the first successful basic steel making in the South, Mr. B. Talbot, Superintendent of the Southern Iron Co., of Chattanooga, writes:

The steel made at Chattanooga is of a superior, mild quality, the following analysis being typical of many heats:

Charge No....	4.	8.	17.	20.	21.	22.	50.	78.	115.	141.
Silicon.....	Traces.	Traces.	Traces.	Traces.	Traces.	Traces.	Traces.	Traces.	Traces.	Traces.
Carbon.....	.09	.09	.08	.06	.06	.06	.07	.10	.09	.10
Sulphur.....	.03	.02	.02	.02	.035	.039	.02	.02	.03	.048
Phosphorus...	.048	.05	.015	.025	.02	.02	.03	.04	.04	048
Manganese....	.42	.31	.24	.42	.45	.45	.40	.30	.33	.37

This metal welds as easily as iron, takes as much fire, and does not require any flux. The tensile strain on steel of the above composition would average not more than 55 to 60,000 pounds on the square inch, with an extension of 28 per cent. on 10 inches, and a reduction of about 60 per cent.; but of course greater tensile can be obtained by changing the composition of the metal accordingly.

Until recently all attempts to make high carbon steel in the basic Siemens furnace have failed on account of irregularity. However, Darby's patent on recarbonizing steel has overcome this difficulty in a cheap and an effective manner. The process consists of running steel through coke or other suitable carbonaceous matter, the result being that the metal is recarburized to the desired point. Any degree of hardness can be obtained by varying the amount of coke in accordance with the percentage of carbon required. This invention is very valuable to the basic Siemens, as it renders easy the manufacture of steel suitable for rails, springs, castings and other purposes.

One of the difficulties which the South has to overcome is the question of wrought iron, or steel scrap. If there were one or two moderate-sized works in operation, they would soon exhaust all scrap in this section of the country, and would cause its value to rise to a prohibitive rate. If economic and quick working is to be obtained, it is necessary to have at least 25 per cent. of the charge of scrap. The reason scrap is so useful in the open-hearth furnace is, that it only contains a small quantity of carbon, and consequently dilutes the percentage of carbon in the bath of metal. This lowering of the carbon contents, saves time and ore in working the charge.

It has been suggested to overcome this difficulty, that the "duplex" process be adopted. By this means, the hot metal is taken from the blast furnace, desiliconized and decarbonized in a Bessemer converter, and is immediately transferred into a basic open-hearth for the elimination of the phosphorus. In England there have been many patents taken out on this process, but it has never come into use, because there, scrap iron is both plentiful and cheap.

When this process is introduced in the South, I think it will be found necessary to make some modifications. I do not believe that economic results will be obtained if the metal is entirely decarbonized before introduction into the basic open-hearth furnace. I have already stated, in describing the working of a charge in the ordinary way, that if the metal is not dephosphorized when decarbonized, it is necessary to add more carbon before the last traces of phosphorus can be rapidly removed.

If this is encountered with only .2 or .3 per cent. of phosphorus, it will be seen that the difficulty will be increased four-fold in attempting to eliminate 1 or 1½ per cent. of phosphorus. In my opinion, it will be found to great advantage if a portion of the carbon is retained in the metal after treatment in the Bessemer vessel. The quantity of carbon left should vary in accordance with the amount of phosphorus.

The following are the results of an experiment which I made to prove the correctness of this theory. I took molten recarburized metal of the undermentioned composition:

Silicon	Traces.
Carbon	2 025
Sulphur	.09
Phosphorus	2.606
Manganese	.156

This was poured into a basic open-hearth furnace, which was at a melting heat, and which contained a molten slag consisting of lime and oxide of iron. Immediately the metal came in contact with the slag, a very active boil commenced, and rapid decarbonizing and dephosphorizing ensued. I took a sample of the metal fifteen minutes after being in the furnace, and the analysis was as follows:

Silicon	Traces.
Carbon	.603
Sulphur	.066
Phosphorus	.432
Manganese	.180

This result showed that 2 174 of phosphorus, and 1.422 of carbon were removed in a very few minutes. So in about 90 minutes the metal was finished steel, and in less than two hours after introduction into the basic furnace, the steel was in the molds, and was of the following analysis:

Silicon	Traces.
Carbon	.09
Sulphur	.054
Phosphorus	.07
Manganese	.40

There is no doubt in my mind that this modification of the basic-Siemens will be very valuable to the South, for by its means steel can be made economically, without scrap. It allows the use of a silicious metal which would be a great boon to the blast furnace owners, whose ores, limestone and coke are of a silicious character. At the same time the most satisfactory results would be obtained from an iron containing not more than two per cent. of silicon, as part of the carbon would be retained in the metal after it was sufficiently desiliconized. If, however, a very silicious iron were used, it would be found, by the time it was desiliconized, that it was also decarbonized. If this decarbonised metal were poured in the open-hearth furnace, I do not think it would be converted into steel as rapidly as if it contained a portion of its original carbon. However, it could be recarburized to the required percentage, which would overcome the objection. My opinion is, that if any large owners of blast furnaces were to erect steel works in conjunction with their furnaces, and if they were to deliver hot metal to the converting department for $9 50 per ton, steel ingots could be made for less than $19. This immense saving would only be effected by building a works which would deal with some three or four thousand tons of metal per week. It would also be necessary to have the plant especially designed to work hot metal, which must not be allowed to get cold, until the saleable product, such as rails, slabs, blooms, billets, etc., is obtained.

The open-hearth would make, on an average, nine or ten heats of steel per day, from each furnace, so that a shop consisting of 10 or 12 furnaces, would take care of three or four thousand tons of desiliconized metal per week. All the furnaces would not be in constant operation, as possibly two of them would be out, undergoing repairs, another two would be hot, and ready to receive a charge, if one of the other furnaces was delayed by any accident or excessive fretting for a few hours.

I will say finally, that if the South is to become the center of steel production, to which its natural wealth entitles it, the manufacture will have to be undertaken in the same spirit and magnitude as the establishments of the North. Years ago they perceived that the acid process was the one adapted to their ores; they have so improved their works in every detail, that now their efficiency leaves nothing to be desired. The South must profit by the experience gained in the North, for wonderful ingenuity and skill have been employed in perfecting both machinery and tools.

Effect of Tannin on Steel.

In a paper which M. Vignon read recently before the French Chemical Society, he gave some notes of his experiences with tannin compounds, and their effect upon the steel plates of boilers. In examining mixtures intended to prevent incrustation, he found that many of them contained tannin compounds together with sodium carbonate. For the purpose of discovering the value of the tannin (which was in the form of a sumac extract) a number of experiments were instituted. Five pieces of boiler plate of the same size were weighed, and one being reserved for the purpose of comparison, the others were boiled for eight hours, one in each of these solutions:

No. 1	8 gal. of water.
No. 2	1 1-5 fluid ounces sumac extract. 8 gal. of water
No. 3	.53 oz. of carbonate of soda. 8 gal. of water.
No. 4	1 1-5 fluid oz. sumac extract. .53 oz. of carbonate of soda. 8 gal. of water.

The plates were afterwards cleaned and dried, and upon being weighed the following results were obtained:

Sample.	Wt. of boiler plate before boiling.	Wt. after boiling.	Loss.
No. 1	3.5418 oz.	3.5401 oz.	.0017 oz.
No. 2	3.3313 "	3.2980 "	.0333 "
No. 3	3.4653 "	3.4651 "	.0002 "
No. 4	3.6487 "	3.6353 "	.0134 "
Unboiled sample	3.4776 "	3.4773 "	.0003 "

From these facts, and a careful observation of the character of the baths from which the steel plates had been removed, M. Vignon has been led to believe: first, that free tannin matters attacks boiler steel; second, that sodium carbonate does not prevent this action; third, that sodium carbonate in itself has no injurious action on boiler plates. He has, therefore, arrived at the conclusion that tannin should not be employed as a preventive of incrustation, because of its corrosive action. A German writer, Herr. Manstetten, disagrees with this view, claiming that after the first attack the metal becomes coated, and is thereby protected from further action of the tannin, and as a result of his experiments and observations he concludes that the danger arising from the use of tannin has been much exaggerated.

The New Steel Rail Combination.

After prolonged delay, and what looked, two weeks ago, like a rupture serious enough to prevent a renewal of negotiations, a consolidation has at last been effected between the great Lackawanna Coal & Iron Co. and the Scranton Steel Co., of Scranton, Pa. It has been the strongly individualized action of the Scranton Co. which has prevented the recently formed steel rail combination from amounting to anything. It is now believed that prices for steel will be better maintained, possibly that an advance will result. The companies in the combination are the Lackawanna Coal & Iron Co., the Cambria Iron Co., of Johnstown, the Bethlehem Iron Co., the Illinois Steel Co., the Pennsylvania Steel Co., and the Edgar Thomson Steel Co. The new company, formed through the consolidation of the Lackawanna and the Scranton, will be known as the Lackawanna Steel & Iron Co. W. W. Scranton, President of the Scranton Co., will become a director in the new corporation, and "will contract not to engage in steel rail making in the Northern States for ten years." Walter Scranton, vice-president of the Scranton Co., "will become sales agent of the new company." W. W. Scranton was formerly general manager of the Lackawanna Coal & Iron Co, but gave up that position several years ago, and formed the Scranton Co., with a capital of $750,000.—[Bradstreet's.

Building at Twenty-five Cities.

The New York *Commercial Bulletin* reports as to the extent of new building in 25 cities of this country, having an aggregate population of 7,500,000, that the number erected during the year 1890 was 61 420, and the estimated value $227,351,691. The total population of the country was about eight and one-half times that of the cities named, the cost of the new buildings during the year in all other cities and towns of only half as great per capita as the cost in the cities named would aggregate about $850 000,000, making the total for the entire country over $1,076,000,000.

INDUSTRIAL SUMMARY.

New Enterprises:—

The Holt Manufacturing Co. has been organized at Hartford, Conn., to manufacture hardware.

W. D. Forbes & Co. are starting a new machine shop at Thirteenth and Hudson streets, Hoboken, N. J., for building special tools, guns, etc.

The James Reynolds Machine Co. has been organized at New Haven, Conn., to manufacture, buy and sell general and special machinery, and machine tools.

R. J. May has sold his foundry and machine shop, at McKeesport, Pa., and has purchased another site on which he will erect a much larger plant, to cost about $50,000.

The Albion Iron Works, capital $200,000, has been organized at Knoxville, Tenn., to build a foundry and machine shop. A. L. McEwon, manager, Cincinnati, can give information.

It is reported that a $50,000 stock company has been organized to erect a wire nail factory, at Salem, Va., to use the patent wire nail machinery, of J. B. Hastings, of Parkersburg, W. Va.

Messrs. L. J. Berger, A. B. Robinson and G. A. Richards have incorporated the American Bridge Works, of Chicago, for the manufacture of bridges. The capital stock is placed at $100,000.

The Drummond-McCall Pipe Foundry Co. is being incorporated at Montreal, with a capital stock of $50,000, to establish works and manufacture cast iron, gas, water and other pipes, etc.

The Van Wagoner & Williams Co., 82 Beekman street, New York, has purchased a large tract of land in Cleveland, and this Spring will erect a large factory and foundry for the manufacture of its goods.

The Hansel Elcock Foundry Co. is a new concern at Chicago, with a capital stock of $75,000; for the manufacture of architectuural works; incorporators, J. R. Hansel, E. G. Elcock and Peter Marshall.

The George R. Ford Boiler Cleaner Co., of Cleveland, has been incorporated, with a capital stock of $10,000; George R. Ford, John E. Chafer, John Becker, Fred. C. Brown and John E. Chafer, Jr., being the incorporators.

The Western Rolling Stock Co., of Chicago, has been incorporated with a capital stock of $100,000, by George E. Farley, Grant S. Wheeler and William E. W. Johnson. It will manufacture cars, engines and other rolling stock.

The New Monitor Co., with a capital stock of $50,000, has been organized at Chicago, for the manufacture of agricultural implements, and to conduct a foundry and planing mill; incorporators, E. Listenwalter, C. N. Coats and P. E. Simmons.

The Taylor Electric Signal Co., of Chicago, has been organized, capital stock $500,000. The company intends to manufacture electrical and mechanical devices and machinery, for steam and street railways; incorporators, C. H. Merrill, Frederick L. Merrill and Geo. W. Heth.

Application has been made for a charter for the Eureka Nut Lock Co., of Pittsburgh, whose business will be the manufacture of bolts, nuts, nut locks, nut lock washers, etc. The incorporators are William H. Hays, John H. Dalzell, David E. Park, John W. Park, Charles A. Ginochio and John Laueri.

Additions, Enlargements, Removals, etc.:—

The Lead Hill Foundry & Machine Shops, at Lead Hill, Ark., expect to put in new machinery.

The size and capacity of the Berlin Machine Works, at Beloit, Wis., will be doubled the coming Spring.

The King Axe Co., of Cleveland, have increased their capacity to $100,000 and are contemplating the enlargement of their plant.

The Common Sense Engine Co., of Springfield, O., have accepted an offer of $25,000 and five acres of land for a site to remove its plant to Martinsburg, W. Va.

Taplin, Rice & Co., of Akron, O., are intending to add some improvements to their works, but are unable to do so at present on account of rush of business.

The Magnetic Machine Manufacturing Co., of Grand Rapids, Mich., are negotiating with a company for the removal of their motor works to Basic City, Va.

The D. F. Morgan Boiler Co., in South Akron, O., intend to build a foundry, 200 feet long and 50 feet wide. It will be brick and one story in height. This company are turning out nearly 200 boilers monthly.

The A. Plammondon Manufacturing Co., of Chicago, will erect early in the Spring, a factory for their own use. The structure will be 385x200 feet, two stories high, and will cost $150,000. Pulleys, shafting, gearing, etc., will be manufactured.

H. B. Cragin, agent of Washburn & Moen, the barbed wire manufacturers of Massachusetts, announces officially that the company has purchased between 800 and 1,000 acres of land adjoining the town of Waukegan, a few miles north of Chicago, and will begin work on its manufacturing plant there this Spring.

The John O'Brien Boiler Co., of St. Louis, Mo., will fit out its new boiler works in that city with an entire new lot of machinery, including new flanging machines and hydraulic riveters. The building will be constructed entirely of iron, the dimensions being 350x400 feet, and it will be one of the most complete establishments of its kind in the West.

The Akron Iron Co., Akron, O., are contemplating some important changes in the arrangement and construction of their plant. Improvements in the rolling are constantly being made, and additions to their power capacity have just been completed. A steam derrick to be operated by 20 men, and a 25-ton pair of steam sheare that will cut five-inch bar iron are some of their latest additions. These shears were made by Taplin, Rice & Co., of Akron, O.

The Reeves Iron Co., Canal Dover, O., are making extensive additions to their works. They have under construction a building 258 ft. long, and 65 ft. wide at one end and 180 ft. at the other, for the manufacture of sheet and galvanized iron. The building and plant when completed will cost not less than $100,000. Only the most improved and latest makes of machinery will be placed in it. This company have added six puddling furnaces and will put in two more as soon as possible, and have also put in a new muck train. The works have not shut down since July and orders booked ahead to keep them busy for some time to come.

Fires and Accidents:—

The main building of the Pound Manufacturing Co., Lockport, N. Y., manufacturers of dredges and boat machinery, has been burned to the ground.

The South Anniston (Ala.) Nail Works & Machine Shops were entirely destroyed by fire on February 22d. The loss is estimated at $30,000, covered by $16,000 insurance. Captain Lewis, the general manager, reports that the works will be rebuilt at once.

General Industrial Notes:—

The immense steam plant manufactory of Russell & Co., at Massillon, O., is running to its full capacity, and is employing over 600 hands.

J. H. Day, of the firm of J. H. Day & Co., Cincinnati, O., is in the South closing up contracts for the sale of several large plants for mining, drying and crushing phosphate, rock and pebbles.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 2nd day of April, 1891, for all the labor and materials required to fix in place complete, the low-pressure, return-circulation, steam-heating and ventilating apparatus for the United States Appraiser's Stores, building at Chicago, Ill.

The New York Central Iron Works Co., of Geneva, N. Y., report business as very good indeed. They are selling a great many of their celebrated Dunning steam heating boilers, also a large number of engines and boilers for manufacturing purposes. They are now employing about 50 hands, but contemplate increasing the size of their plant this season, as they are crowded for room in present quarters. The outlook for a good Spring trade, with them, is promising.

The Stirling Co., of New Portage, O., manufacturers of high pressure water tube boilers, have began operations. The plant is one of the finest equipped boiler works in the country; containing the latest improved machinery for their business. The building is 200x85 and is built of brick. A 124-inch gap hydraulic riveting machine, built by Wm. Sellers & Co., is being used by them. The total cost of the plant was $58,000; $14,000 for building and $44,000 for machinery.

A finely illustrated 200-page catalogue of blowers, heating and drying apparatus, portable forges, engines, etc., has just been issued by the B. F. Sturtevant Co., Boston, Mass. It is devoted principally to the general line of

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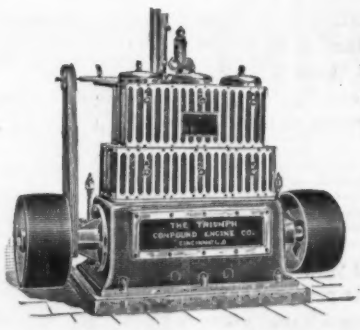

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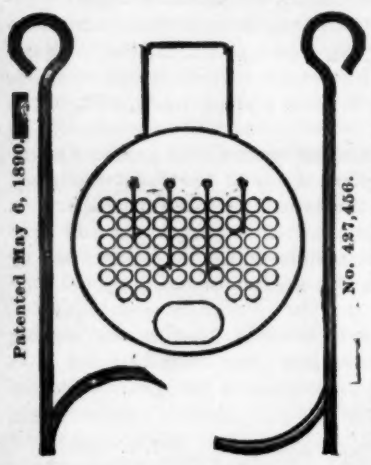
goods and method of introduction, as special catalogues are published, relating to the different departments of work. The catalogue bears marked evidence of the prosperity of the firm and of its thorough acquaintance with this branch of engineering.

The record on rod mill rolling has been again sharply raised. During the week ending March 7, the Joliet mill of the Illinois Steel Co. rolled 1,318 gross tons No. 5 rods, working ten hours a turn, and eight hours on Saturday; in all 11 turns. The best record per turn of ten hours was made on Friday, March 6, when there were rolled in the mill 314,750 pounds of No. 5 rods.

The Wrought Iron Bridge Co., Canton, O., are at present closed down for inventory, but will resume work as soon as that task is completed. This company have just closed a contract for building an all steel viaduct at 21st street, St. Louis, Mo., the dimensions of which are as follows: Three spans of 139 feet each, four spans of 59 feet each, nine spans of 53 feet each, and one span each of 204, 150 and 65 feet. The total length is 1,273 feet, with a width of 51 feet, 8 inches. The material used in its construction will weigh about 1,300 tons.

Webster, Camp & Lane Machine Co., of Akron, O., have gained a national reputation for the manufacture of heavy hoisting machinery, and of their justly famous Akron Corliss engine, one of which has just been shipped to Mexico. This firm have contracted to build for the Hamilton Ore Co., of Sharon, Pa., a hoisting plant of unusual size for their mines at Iron Mountain, Mich. The plant will consist of two pair of Corliss hoisting engines, each pair of 800 horse-power. The cylinders are each of 32 in. bore, with 72 in. stroke. The hoist will be something like 2,500 feet and 10 tons of ore will make a load, which will be the largest load of ore hoisted in this country, the average being about two tons. The total weight of the plant will be 300 tons, and it will be over a year before the last of the machinery will be shipped. The amount of the contract was $40,000.



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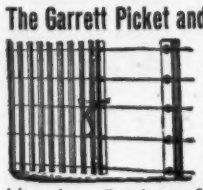

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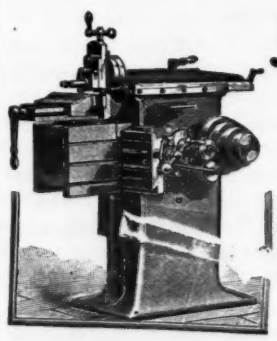

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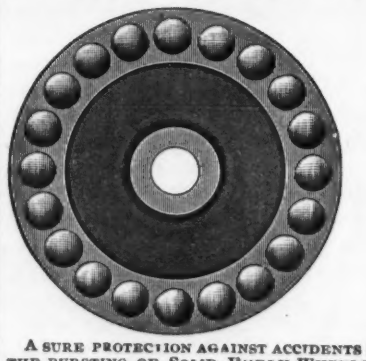

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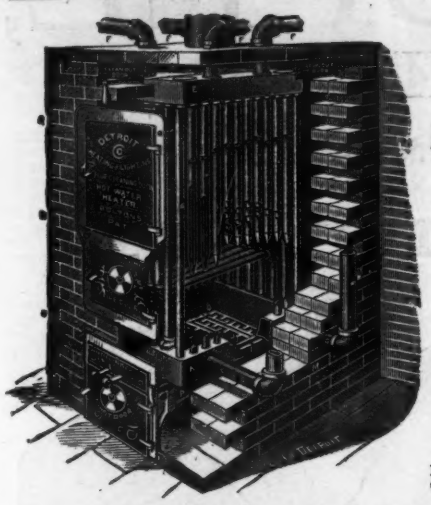

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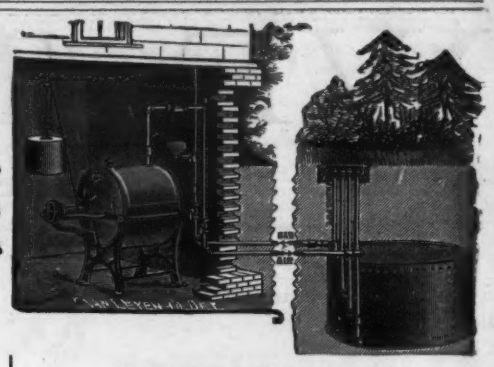

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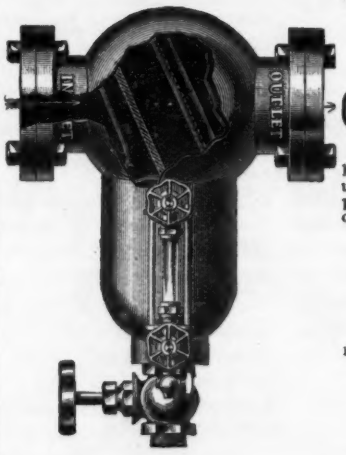

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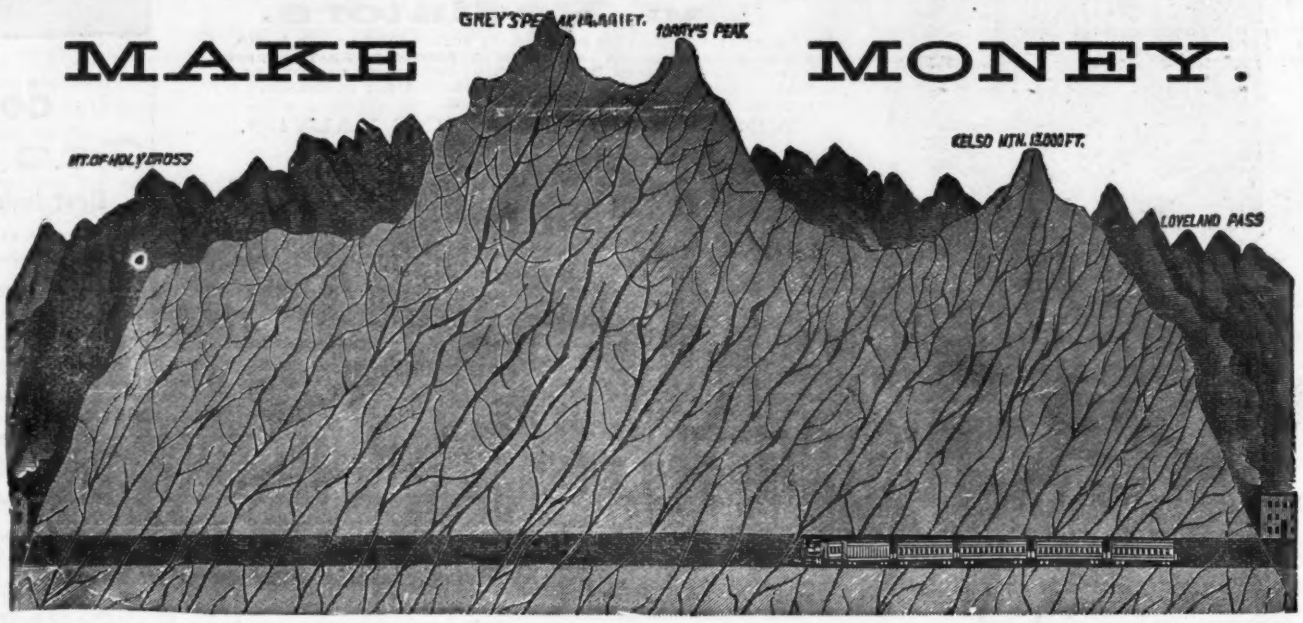
CUTTING THROUGH THE ROCKY MOUNTAINS.

MAKE MONEY.

Showing what the Atlantic-Pacific Railway Tunnel Company is doing to open a tunnel or gateway through the backbone of the American Continent, so cars can run direct from Denver, Colorado, to Salt Lake City, Utah, and shorten the railway distance more than 230 miles between these two cities.

This picture shows how it is done. The object is threefold.



WEST END. EAST END.

1. To get access to more than 250 rich veins of gold and silver ore, that form the great mineral belt of Colorado, and that are here found, standing as shown in the above cut More than 250 of these fissure veins have already been discovered at the surface. They come, up following volcanic action, from the center of the earth. From these veins thousands of tons of gold and silver ore can be can be brought out through the tunnel each day for market, and sold for the benefit of all who own shares issued by the Atlantic-Pacific Railway Tunnel Company.

2. To open a gateway for railway purposes through the main, snow-capped range of the Rocky Mountains, to a point due west from Denver.

3. To open a section of country west from Denver, between the Rocky Mountains, comprising western Colorado and eastern Utah. This section, an area larger than the State of New York, will thus be opened to business and civilization, and made directly and easily accessible from Denver.

The cut shows the manner of getting into the hundreds of veins the tunnel is cutting through so that they can be driven into, to the right and left of the tunnel. Thus their contents of gold, silver, copper and lead, worth in cash from $100 to $3,500 per ton, can be mined out under cover the year around, dumped directly into the railway cars and run to Denver, 60 miles, direct into the smelters, without extra charge for repeated handling and wagon transportation.

These mineral bearing veins are from one to thirty feet in width. Their contents vary in thickness and quality, but the average exceeds four feet, and the average value exceeds $200 per ton.

These veins are thus opened at greater depths than any mines in the world have ever been descended into.

BETTER THAN 8 PER CENT.

The Atlantic-Pacific Railway Tunnel Company

Incorporated in 1884 to buy land, mines, mill sites, water powers, machinery, etc., in Colorado, to pay for the same in shares or money; to open mines and carry on the business of mining and treating of ores; to open a tunnel, and operate the same for mining as well as general railway purposes later on.

Under and in strict conformity with its charter it has authorized the issuance of 700,000 SHARES OF THE PAR VALUE OF $10 each. It has disposed of about 500,000 of its shares for valuable properties in the counties of Clear Creek and Summit, Colorado, and for such cash as has thus far been used to develop and improve its properties.

Its shares are full paid, and no taxes or assessments can be laid against them, and, therefore, no act of the Company can deprive one person of his share or shares for the benefit of others.

Two hundred thousand shares still in its treasury for sale, as the Company offers them for improvement purposes.

MORE THAN 4,600 men, women and children now jointly interested as share owners, and, therefore, members of the Atlantic-Pacific Railway Tunnel Co.

☞The Company has more than four millions of dollars' worth of property all fully paid for.

☞All its interest obligations are met promptly as they mature.

More than 5,000 feet of tunnel already driven, including 3,100 feet on the east side of the Rocky Mountains, 60 miles due west from Denver, Colo, and more than 1,400 feet of tunnel driven into the west side of the mountains, as well as side tunnels into veins.

Main tunnel, when completed for railway use, will be 25,200 feet long.

More than $2,000,000 worth of gold, silver, copper and lead owned by this Company, already in sight, to be marketed in the future.

Work going on in the tunnel and in the mines day and night.

More than 250 rich, large veins of mineral, gold, silver, copper and lead are being cut by this tunnel, at depths ranging from 1,000 to 4,400 feet below their surface, so that millions of dollars' worth of the precious metals can be brought out each year and sold, the profits all going to share owners in exact proportion to the number of shares each person owns.

Full paid, non-assessable, non-taxable shares in the above-named Company, making the purchaser a MEMBER OF THE COMPANY and a JOINT OWNER in all the rights, properties, franchises and profits from sale of ore, land and mineral, and from all rentals as they accrue. These shares are of the PAR VALUE OF $10 EACH. Present selling price, $6 each, but no fewer than TWO SHARES will be sold at a time. No personal liability to share owners, and no running in debt by the Company.

On money thus invested, the investor will receive FIFTY CENTS A YEAR CASH as interest on each guaranteed share making 8 1-3 per cent. yearly interest on the sum actually invested, and as the Company makes the money to pay large dividends or interest, it will be paid. But FIFTY CENTS A YEAR CASH INTEREST can be counted on to a certainty. It will not be long before a steadily increasing rate of interests or dividends will be paid.

Every dollar promised as dividends on guaranteed shares named above, paid. Any person can become a joint owner in this, the greatest mining enterprise in the world, who can pay for two or more shares and have as many votes in all affairs of the Company as he or she owns shares.

Investment safe, certain and increasingly profitable. Each investor, man, woman or child, becomes one of a great co operative association where capital and labor are in harmony and each alike protected. Any one can invest. Shares issued direct to the purchaser the day the pay therefor is received, and at the end of each year from the date of issuing the shares, the interest will be promptly remitted. Price $6 each. No fewer than two shares sold at a time.

Eight per cent. Bonds, First Mortgage,

are also offered; the entire proceeds arising from sale of bonds or shares going to increase the properties of the Company. Bonds $250 and $1,000 each. Interest payable in cash March 1st and September 1st each year till 1907, when the principal will be paid. Interest on bonds paid by sale of gold, silver and lead taken from the properties of the Company. With each bond is given an option for the purchaser to exchange it for shares when the Company prove it will be best for the investor to exchange if he wishes to. $1,700,000 of these A1 securities yet for sale, out of $2,000,000 authorized.

NOTE THESE FACTS.—All properties fully paid for. All interest obligations fully paid. Work going on in both ends of the tunnel all the time, bringing silver and lead ore from both ends of the tunnel. All debts of the Company for interest supplies, labor, taxes, etc., to date of March 1, 1891, fully paid.

Four contractors working at east end of tunnel—one in tunnel work, the others opening mineral veins—and one contractor at west end. An additional plant of (steam and water motor) 240-horse-power ordered for east end of tunnel, to be used exclusively for mining—the present one being used for tunneling purposes.

There is no better, safer or more permanently valuable enterprise than this in the world. In time it will pay 100 per cent. each year on the investment.

Bonds sold only at par, counting interest from date of investment.

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CHICAGO (reported by Messrs. Rogers, Brown & Merwin): Southern Coke No. 1 foundry, $16 25@17 00; Southern Coke No. 2 Foundry, $15 75@16 50; Southern Coke No. 3 Foundry, $15 25@16 00; Southern Coke No 1, Softeners, $15 75@16 50; Southern Coke No. 2, Softeners, $14 75@15 50; Ohio Silveries No. 1, $18 00@18 75; Ohio Silveries No. 2, $17 00@ 17 75; Ohio Strong Softeners No. 1, $18 25@19 50; Ohio Strong Softeners No. 2, $17 50@18 75; Lake Superior Charcoal Nos. 1 to 6, $18 00@19 00; Tennessee Charcoal No. 1, $18 00@19 00; Tennessee Charcoal No. 2, $17 50@18 50; Southern Standard Car Wheel, $21 00@23 00; Tennessee Standard Car Wheel, $00 00@00 00.

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $15 00@15 25; Hanging Rock Coke, No. 1 foundry, $16 50@17 50; Jackson Co. Stone Coal, No. 1 foundry, $16 50@17 00; Tennessee Charcoal, No. 1 foundry, $16 50@17 50; Hanging Rock Charcoal, No. 1 foundry, $20 00@22 00. MILL IRONS—Standard Southern Coke, grey forge, $13 25@13 75; Standard Southern Coke, mottled, $13 00@13 25; Cold Short Southern Coke, grey forge, $12 75@13 00; Strong Ohio Neutral Coke, grey forge, $15 00@15 50. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $20 00@20 50; Tennessee Car Wheel, $18 50@19 50; Lake Superior Car Wheel, $19 50@20 50.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $17 00@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $16 00@00 00; Ohio Softener No. 1, $17 00@00 00; Ohio Softener No. 2, $16 00@ 00 00; Jackson Co. Silveries, $18 00@00 00; Lake Superior Charcoal, $20 00@00 00; Tennessee Charcoal, $19 00@00 00; Southern Softener No. 1, $16 50@00 00; Southern Softener No. 2, $15 75@00 00; Southern Strong No. 1 Foundry, $17 00@00 00; Southern Strong No. 2 Foundry, $16 25@00 00; Alabama Car Wheel, $22 25@23 00; Hanging Rock Charcoal, $23 00@24 00

LOUISVILLE (reported by Hall Bros. & Co.) HOT BLAST FOUNDRY—Southern coke No. 1, $14 25@14 50; Southern coke No. 2, $13 75@14 00; Southern coke No. 3, $13 25@13 50; Mahoning Valley (Lake ore mixtures), $00 00@00 00; Southern charcoal, No. 1, $16 50@17 00; Southern charcoal, No. 2, $16 00@16 50; Missouri charcoal, No. 1, $17 50@18 00; Missouri charcoal, No. 2, $17 00@17 50. FORGE—Neutral coke, $12 50@13 00; Cold short, $12 50@13 00; Mottled, $12 00@12 25. CAR WHEEL AND MALLEABLE—Southern (standard brands), $21 00@22 00; Southern (other brands), $17 50@18 00; Lake Superior, $21 50@22 50.

ST. LOUIS (reported by Rogers, Brown & Meacham): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $16 00@16 25; Southern Coke No. 2, $15 00@15 25; Southern Coke No. 3, $14 25@14 75; Southern Grey Forge, $14 00@14 25; Southern Charcoal No. 1, $17 75@18 00; Southern Charcoal No. 2, $17 25@17 50; Missouri Charcoal No. 1, $15 50@16 00; Missouri Charcoal No. 2, $15 00@15 50; Ohio Softeners, $18 00@19 50. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $20 00@20 50; Southern, $19 00@21 00. CONNELLSVILLE COKE—East St. Louis, $0 00; St. Louis, $5 65.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $18 50@19 00; Lake Superior (coke) Bessemer, $18 00@18 50; Katahdin (Maine charcoal), $23 00@24 00; Lake Superior Coke, Foundry, all ore, $18 00@18 50; Lake Superior Coke, Foundry, all ore, $00 00@00 00; Standard Ohio Black Band, $18 00@18 50; Southern No. 1 $16 25@16 75; Southern Gray Forge, $14 75@15 25; Jackson County (Ohio) Silvery, $18 25@18 75; Old Car Wheel, $00 00@00 00. Connellsville Coke, $4.65.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry $14 25@14 75; Southern Coke No. 2 Foundry $13 75@14 25; Southern Coke No. 3 Foundry $13 25@13 75; Grey Forge, $12 75@13 25; Southern Coke Silver Grey, $00 00@00 00; Southern Charcoal No. 1 Foundry, $16 00@17 00; Car Wheel, $17 00@20 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $16 75@17 00; No. 2 Foundry, $15 75@16 00; Grey Forge, $15 00@15 25; White and Mottled, $14 00@14 25; Warm Blast Charcoal, $18 00@20 00; Cold Blast Charcoal $12 00@27 00; Bessemer, $16 75@17 00.

MERCHANT IRON AND STEEL.

Flat Bar

1½ to 4 by ⅜ to 1 inch	1 80
4½ to 6 by ⅜ to 1 inch	1 90
1½ to 6 by 1¼ to 2 inch	2 20
1¼ & 1½ by ⅜ to ½ inch	1 90
1 & 1¼ by ⅜ to ½ inch	2 00
⅝, ¾ and ⅞ by ⅜ to ½ inch	2 20

Round and Square.

1 to 1⅞ inch	1 80
2 to 2½ inch	2 00
2⅝ to 3¼ inch	2 10
3⅜ to 4 inch	2 80
4⅛ to 4½ inch	3 30
4¾ to 5 inch	3 50

Oval.

½ to 1¼ inch	2 20
⅝ to ¾ inch	2 40
⅞	2 60
1	3 00

Half Oval and Half Round.

1¼ to 2 inch	2 90
⅝ to 1¼ inch	2 50
⅝ to ¾ inch	3 10
⅞	3 30
1	4 80

Heavy Band.

½ to 6 by ¼ and 5-16 inch	2 00
½ to 1½ by ¼ and 5-16 inch	2 10
½ to ⅞ by ¼ and 5-16 inch	2 30
to ⅞ by ⅜ and 5-16 inch	3 80

Hoops.

1¼ to 4, Nos. 13 to 15	2 60
1¼ to 2, Nos. 16 to 18	2 70
1¼ to 2, No. 19	2 80
1¼ to 2, No. 20	2 90
1¼ to 2, No. 21	3 00
1¼ to 2, No. 22	3 10
15-16, 1 and 1¼, Nos. 13 to 15	2 80
15-16, 1 and 1¼, Nos. 16 to 18	2 90
15-16, 1 and 1¼, Nos. 19 and 20	3 00
15-16, 1 and 1¼, No. 21	3 10
15-16, 1 and 1¼, No. 22	3 20
⅞, Nos. 13 to 15	3 00
⅞, Nos. 16 to 18	3 10
⅞, Nos. 19 and 20	3 20
⅞, No. 21	3 30
⅞, No. 22	3 40
13-16, Nos. 13 to 15	3 20
13-16, Nos. 16 to 18	3 30
13-16, Nos. 19 and 20	3 40
13-16, No. 21	3 50
13-16, No. 22	3 60
¾, Nos. 13 to 15	3 30
¾, Nos. 16 to 18	3 50
¾, Nos. 19 and 20	3 70
¾, No. 21	3 70
¾, No. 22	3 80
11-16, Nos. 13 to 15	3 50
11-16, Nos. 16 to 18	3 70
11-16, Nos. 19 and 20	3 80
11-16, No. 21	3 90
11-16, No. 22	4 00
⅝, Nos. 13 to 15	3 80
⅝, Nos. 16 to 18	4 00
⅝, Nos. 19 and 20	4 10
⅝, No. 21	4 20
⅝, No. 22	4 30
⅝, No. 23	4 50

Light Band.

1¼ to 6 by ⅛ to 3-16 in	2 20
1¼ to 6 by Nos. 11 and 12	2 30
1 to 1¼ by ⅛ to 3-16 in	2 40
1 to 1¼ by Nos. 11 and 12	2 50
⅞ and 13-16 by ⅛ to 3-16 in	2 70
⅞ and 13-16 by Nos. 11 and 12	2 80
¾ and 11-16 by ⅛ to 3-16 in	3 00
¾ and 11-16 by Nos. 11 and 12	3 10
⅝ and 9-16 by ⅛ to 3-16 in	3 20
⅝ and 9-16 by Nos. 11 and 12	3 40
½ by ⅛ to 3-16 in	3 60
½ by Nos. 11 and 12	3 70

Wagon Box Iron.

⅜ inch, beveled edge, by Nos. 11 and 12	3 80
⅜ inch, " " " 13 and 14	3 00
¼ inch, " " " 11 and 12	3 10
¼ inch, " " " 13 and 14	3 30

Sheet Iron:

No. 10 to 14	2 65
No. 15 to 17	2 75
No. 18 to 21	2 99
No. 22 to 24	3 15
No. 25 to 26	3 30
No. 27	3 40
No. 28	3 50

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 60
C No. 1, " "	2 85
C H No. 1 " "	3 10
C H Flange, " "	3 85
Extra Flange, "	4 35
Solid Fire Box "	5 10

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 75
Shell	3 15
Flange	3 45
Marine Flange	3 85
Fire Box	4 55

Above includes plates 90 inches wide.

90 to 96 in. wide	⅜c ₱ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1⅜c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ₱s
1 to 2 in. inclusive	09
9-16 to ⅞ in "	09
7-16 to ⅝ and 2¾ to 3 in	10¾
3¼ to 4 in	11
⅝ to 11-16 and 4⅛	10¾
⅝ to 6 in	11½
¼ to 9-32 and 6½ to 7 in	12
3-6 in	14

Flats.

	cts. ₱s
2 to 9-16 wide by 2 to ⅛ thick	9

Bessemer and O. H. Steel.

Machinery	base price,	2 75
Tire	"	2 75
Spring	"	3 25
Sleigh Shoe	"	2 75
Toe Calk	"	3 00
Cutter Shoes, tapered and burr.	"	3 00

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

⅛, ¾, 11-16 and ¼ inches diameter	4 00
Bridge ⅛, ¾, 11-16 and ¼ inch diam	4 00

SCRAP IRON AND OLD METAL.

	NET TONS
No. 1 R. R. wrought scrap	$19 00
No. 1 wrought scrap	17 00
No. 1 Machine cast scrap	12 00
Iron axles	24 00
Axle turnings	13 50
Wrought turning (free from cast)	12 00
Cast borings	8 00
Uncut wrought iron boilers	11 00
Steel boiler plates	17 00
Grate Bars	8 00
Pipes and flues (Clean)	13 50
Tank iron	13 50
Hoop and band iron	10 00
Sheet iron	9 50
Wrought drillings	11 00
Malleable iron	10 00

Reported by Messrs. BLACK & POLLOCK, Cincinnati, O.:

Railroad Wrought	$20 00
No. 1 Country Wrought	17 00
Stove Plate	8 75
Machine Castings	11 00
Hoop and Sheet	8 00
Casting Borings	9 00
Wrought Turnings	13 00

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Ball-Norton (Monarch) Electro Magnetic Separator.
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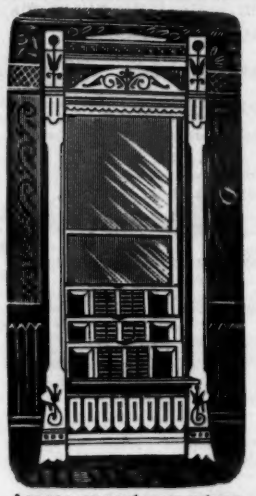
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Cowles Aluminum Brass,
Cowles Silver Bronze,
Cowles Silicon Bronze,
Cowles Aluminum Iron
INGOTS AND CASTINGS.
Correspondence olicited.

MACHINERY SUPPLY MARKET.

Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 12

Bellows.

Blacksmiths' { Hill's.....dis 40 / Bullock's....dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70
" " " extra.....dis 60&5
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard..dis 60&10
Shults Raw Hide Leather Belting, single.....dis 40
Shults Raw Hide Leather Belting, double and Light Double.....dis 40
Standard, oak tanned.....dis 50@60
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 9¼@10¼

Chalk.

White.....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
Whiton's Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Almond Drill.....dis 20
Morse " .....dis 15
Skinner's Combination Lathe.....dis 33⅓
" Independent Lathe.....dis 40
" Universal Lathe.....dis 40
" Drill.....dis 15

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3¼

Drill and Drill Sockets.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1¼".....dis 50&10
Morse Taper and Straight shank Larger than 1¼".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " " .....dis 55@55&5

Emery.

	No. 4 to No. 54 46 gr.	to Flour, C. F. 150. gr.	F.	FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4½c	5½c		2¾c
¼ kegs ₩ lb	4¾c	5¾c		3 c
10 lb cans, 10 in case	6 c	6¾c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 50@50&5

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
ndustry File Works, hand cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	2½
Hexagon	15⅜	11½	8½	6	5½	5¼	5
Washers	9	8	7	5	4½	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 48
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ¼ inch and over.....₩ lb 15¾
Sisal, ¼ inch and over .....₩ lb 13¾

Sand Paper.

B. A. & Co.....dis45@50
H. H. Barton's.....dis40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 40@45
" Band.....dis 20
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 20
Atkins' Cicular Saws.....dis 40&45
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 53c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅛ lb Balls		21c@29c
No. 18 " " ¼ and ⅛ "		18c@28c
No. 36 " " ¼ and ⅛ "		16c@27c
2-Ply Hemp, ¼ & ⅛ lb Balls (Spring Twine)	11¼c	
3-Ply " 1lb Balls	12@12¼c	
3-Ply " 1½ lb Balls	11@11¼c	
Cotton Wrapping, 5 Balls to lb	15@16c	

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30

Wire.

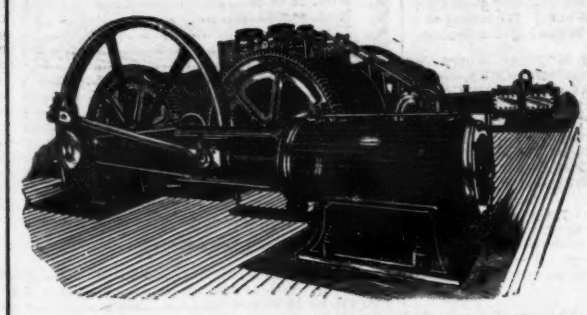
New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75&5
" " Nos. 27@36..dis 75&10&5
Coppered Nos. 0 to 18, market list..dis 70@70&5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$5.00@lb dis 5

Wrenches.

Coe's genuine, ...dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " .....dis 10
Alligator " " .....dis 40

Webster, Camp & Lane Machine Co.



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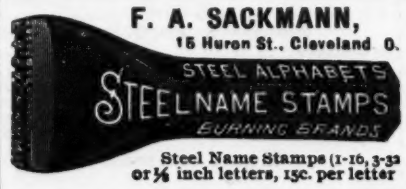

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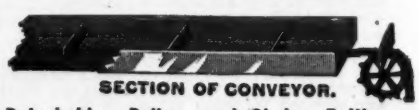

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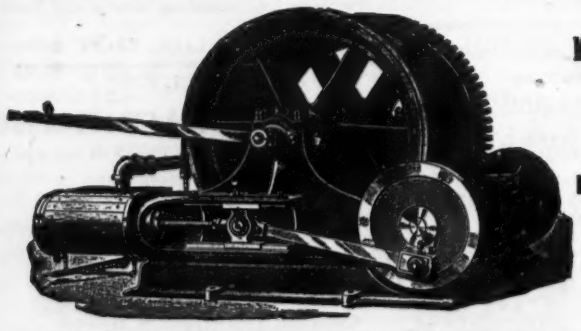

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Augers and Bits.

Common augers and bits.....dis 70
Snell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₩ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₩ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $3 25@4 00
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....₩ doz $8 00
Others.....₩ doz $7 00
Full polished.....₩ doz $9 00

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10

Sargent's list
Carriage, common, new list.....dis 75&10&5
Tire, common, new list.....dis 65
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 60
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60
Fast joint, broad.....dis 50&10@60
Loose joint.....dis 70&10
Loose joint, jap.....dis 70&10
Loose joint, jap. with acorns.....dis 70&10
Loose pin, acorns.....dis 70&10
Loose pin, japanned acorns.....dis 70&10
Loose pin, acorns, jap. plated tips.....dis 70&10
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10
Wrought, fast joint, broad.....dis 70&10
Wrought, loose joint, broad.....dis 70&10
Table Butts, back flaps, etc.....dis 70&10
Regular inside blind.....dis 70&10
Light inside blind.....dis 70&10
Loose pin.....dis 70&10
Light loose pin.....dis 70&10

Carbonized Felt and Building Papers.

(POWERVILLE BRAND.)

	Per roll of 500 sq. feet.
Eberts Bros., Detroit.	
No. 1—Slaters'.....	$1.25
"A," Stringed Roofing, Light.....	1.50
"B," Stringed Roofing, Medium.....	1.75
"C," Stringed Roofing, Heavy.....	2.00
Stringed, Rosin-Sized.....	1.00

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Asphaltum, Trinidad Refined, ₩ ton.....$30.00
Asphaltum, Fine Grade, ₩ ₤.....08
Coal Tar Felt, 1 Ply, ₩ ₤.....02
Coal Tar Felt, 2 Ply, ₩ roll 108 sq ft.....1.42½
Coal Tar Felt, 3 Ply, ₩ roll 108 sq ft.....1.85
Roofing Pitch, ₩ gal.....09

Chains.

Revised List.
Trace, 6¼-10-2.....₩ pair 1.03
Trace, 6¼-10-3.....₩ pair .92 } .....50&10
Trace, 7-10-2.....₩ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887.....dis 50&10@60
Galvanised Pump Chain.....₩ ₤5½@6
Jack Chain, Iron.....dis 75&10
Jack Chain, Brass.....dis 75

Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Fibre Ware—Standard.

	Nos. 1	5.	5X.
Pails, water, 12 qt	$4 00	$4 50	$.....
Dairy, 14 qt	4 50	5 00	.....
Fire 12 qt	5 00	.....	.....
Sugar	6 00	6 50	.....
Horse	.....	5 00	.....
Buggy	4 00	.....	.....
Chamber, Slop, Commode } 5 and 5X 14 qt.	6 50	7 50	8 50
2 rs. slop, 5 and 5X 14 qt	8 00	9 00	10 00
Basins, wash—			
10½ inch	2 00	2 25	.....
12 inch	2 25	2 75	3 25
13½ inch	2 75	3 25	3 75
15 inch	3 25	3 75	4 25
Bowls, fruit	.....	2 50	.....
Servers, 12 in	.....	2 25	.....
Baskets, waste paper, 13 in	.....	6 00	.....
Spittons, "Daisy," pressed 8 inch	4 00	4 50	5 00
10 and 11¼ inch	6 00	6 50	7 50

No. 1 plain; No. 5 decorated; No. 5X White decorated.

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....₩ gross $12, dis 25@25&5

Hanger

Barn door, old patterns.....dis 60&10&10@70
Climax, (Anti-Friction).....dis 60
Scranton.....dis 33—
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

	No. 10	9	8	7	6	
Ausable, ₩ ₤	23	24	25	26	28	dis 40
Putnam, ₩ ₤	18	19	20	21	23	dis 15
Essex						dis 25&10

Horse Shoes.

Burden, at factory.....₩ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....₩ keg $4 00
Mule Shoes, at factory.....₩ keg $5 00

Knobs.

Carriage, japanned.....₩ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hematite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbin, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60&10
Escutcheons and keys.....dis 60&10
Padlocks and padlock keys.....dis 75
Bell pulls, mineral, porcelain and jet dis 60&10
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 70
Letter box plates, genuine bronze...dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....₩ gross $4.80

Plumbs and Levels.

Standard list.....dis 70&10
Pocket levels.....dis 70&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods.....dis 70@70&5

Pokes, Animal.

Bishop's I. X. L.....₩ doz $6 00
Bishop's O K.....₩ doz $5 25
Bishop's Pioneer.....₩ doz $3 75
Bishop's American.....₩ doz $2 75

Rakes.

Cast steel.....dis 70
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 30
Wostenholme & Butcher.....$10@$....dis 10
Rifle razor.....dis $9 50 net

Rat Killers.

Schuyler's.....₩ gross $15 00

Scales.

Hatch, Counter, No. 171.....₩ doz $21 00
Hatch, Tea, No. 161.....₩ doz $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....₩ doz $18 dis 25

Squares.

Steel and iron, Nickel plated..... } dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, Oct. 19, 1890.
American iron carpet tacks all kinds dis 77½&10
Steel carpet tacks all kinds.....dis 75&10
Swedes iron carpet tacks, all kinds dis 75&10
Swedes iron tacks.....dis 75&10
Swedes iron Upholsterers' tacks.....dis 75&10
Tinned Swedes iron tacks.....dis 77½&10
Tinned Swedes iron Upholsterers' tacks.....dis 77½&10
American iron cut tacks.....dis 77½&10
Copper tacks.....dis 4[illegible]&10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 50&10
Finishing nails.....dis 62&10
Hungarian nails and miners' tacks..dis 60&10
Gimp and lace tacks.....dis 77½&10
" " " tinned.....dis 60&10
Trunk and clout nails.....dis 72½&10
Tinned trunk&clout nails.....dis 66&10
Basket nails.....dis 66&10
Chair nails.....dis 66&10
Common and patent brads.....dis 66&10

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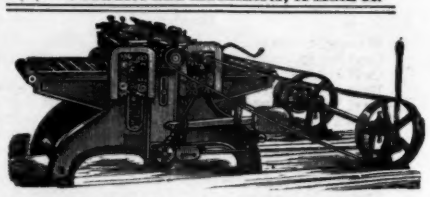

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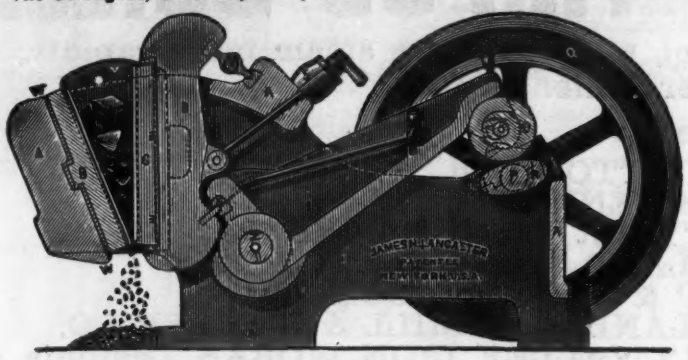

Instantly adjustable to yield any desired uniform grades of product.

Half the power only required and is less liable to breakage, and less in first cost and also in subsequent wear and tear, and less weight than any rival's breaker. For crushing rock for macadamizing and concreting purposes, and also for reducing ores, these breakers are specially efficient.

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Will automatically dig, raise and discharge mud, clay, gravel, sand, hard pan ores, rock phosphates and fire-clay from their beds and banks, and also load and unload vessels or barges with sand, coal, ores, grain and other materials. These Grapples are made of best forged steel, with four penetrating scoops, operated solely by compound leverage, thus dispensing with the inside sheaves, drums, catches, gears, chains and friction, found in all rival buckets. They may be worked by the "Lancaster" hand or horse-power, hoisters, or by any maker's double drum hoisting engines.

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Standard Time.

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Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express.....	†5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express*	10 55 a m	*3 00 p m
Mahoning Accommo.....		†6 40 a m
Pittsburgh Express.....	†6 25 p m	
Youngstown Local.....	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom.....		†4 30 p m
Pittsburgh Express.....	†1 20 p m	11 10 p m
New York Express.....	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.
(Standard Gauge.)

Depart for—
Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—
Zanesville and Coshocton—10:30 a. m.,6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.
Trains marked * run daily.

Valley Railway.
FOR AKRON, CANTON AND MARIETTA.
Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail.....	*7 25 a m	*6 40 p m
Marietta Express.....	†11 15 a m	†2 35 p m
Bal'to. & Wash. Express....	*4 00 p m	*10 25 a m
Cleve. and Canton Express	†6 30 p m	†8 15 a m

*Daily. †Daily, except Sunday.

J. T. JOHNSON, Gen. Supt. J. B. CAVEN, Gen. Pass. Agt.

From Cleveland Union Station.

PENNSYLVANIA LINES.

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	7 45 a m	d5 25 a m
	1 15 p m	12 50 p m
	d11 10 p m	6 35 p m
Wheeling and Bellaire.	7 45 a m	12 50 p m
	1 15 p m	6 35 p m
	*11 10 p m	.....
Alliance Accom.....	3 25 p m	10 10 a m
Ravenna Accom.....	5 00 p m	8 25 a m

d Daily. * Except Saturday. Other trains except Sunday.

From Cleveland Union Station.

Mt Vernon and Pan Handle Route

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus, Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest.	8 00 a m	d 7 00 am
	d 8 00 p m	5 40 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon and Columbus.	1 15 p m	12 50 p m
For Cuyahoga Falls, Akron, Orrville, Chicago, and all points in the West and Northwest.	8 00 a m	5 40 p m
	3 25 p m	10 10 a m

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	Depart.
No. 62, Accommodation.....	† 6 05 a m
No. 72, New York & Pitts. Express....	* 8 10 a m
No. 70, Pittsburgh Accom.....	*11 25 a m
No. 64, New York & Pitts. Limited...	* 2 50 p m
No. 66, Mantua Accommo.....	* 4 20 p m
No. 74, Youngst'n Ex.....	† 6 00 p m
No. 68, New York & Pitts. Ex.....	*11 00 p m
	Arrive.
No. 61, N. Y. & Pittsburgh Express...	† 5 15 a m
No. 71, Youngstown Accom.....	* 7 15 a m
No. 65, New York & Pitts. Lim.....	* 9 55 a m
No. 67, Pittsburgh Accom.....	*12 45 p m
No. 73, Leavittsburgh Local.....	* 2 10 p m
No. 63, New York & Pitts. Ex.....	* 6 50 p m
No. 75, Mantua Accom.....	* 7 20 p m
No. 69, Youngstown Express.....	† 9 10 p m

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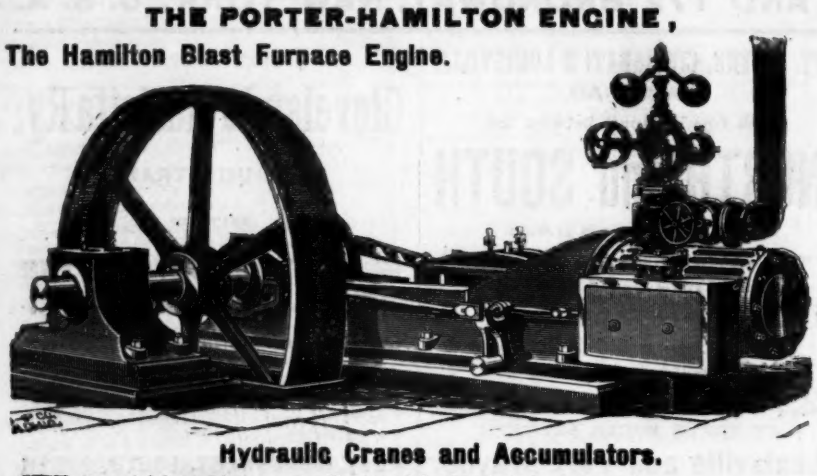

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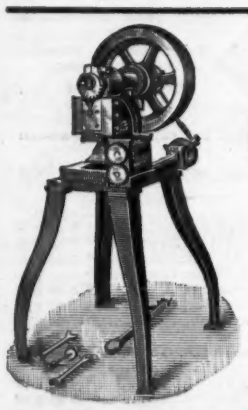

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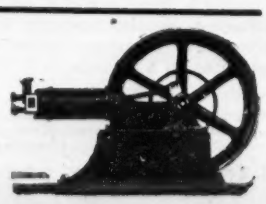

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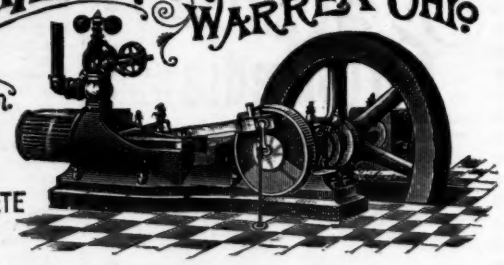

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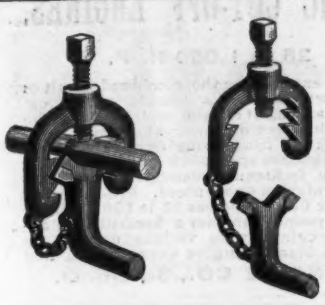

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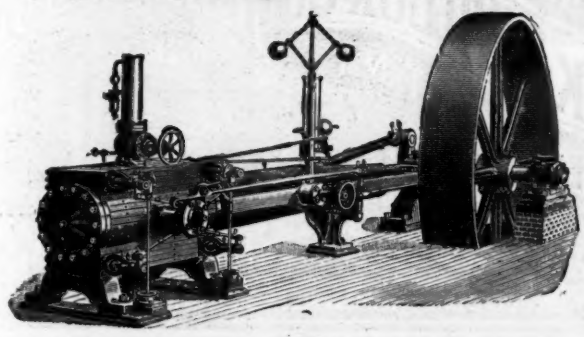

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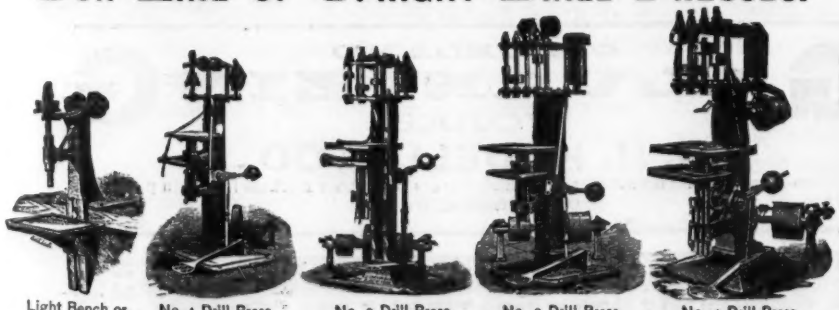

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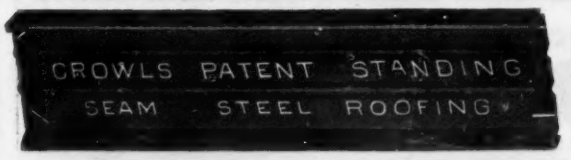

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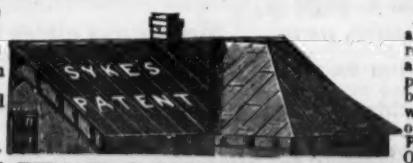

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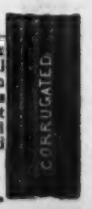

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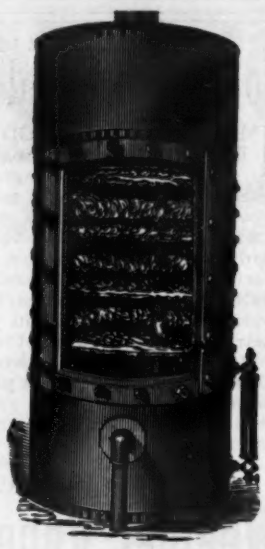

This cut is the fac simile of the appearance of the shelves of a No. 5 Heater at work on ordinary lime-water when the door was removed after the Heater had been running two weeks.

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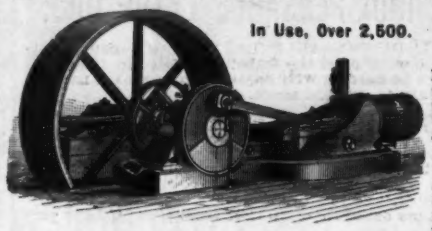

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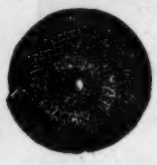

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